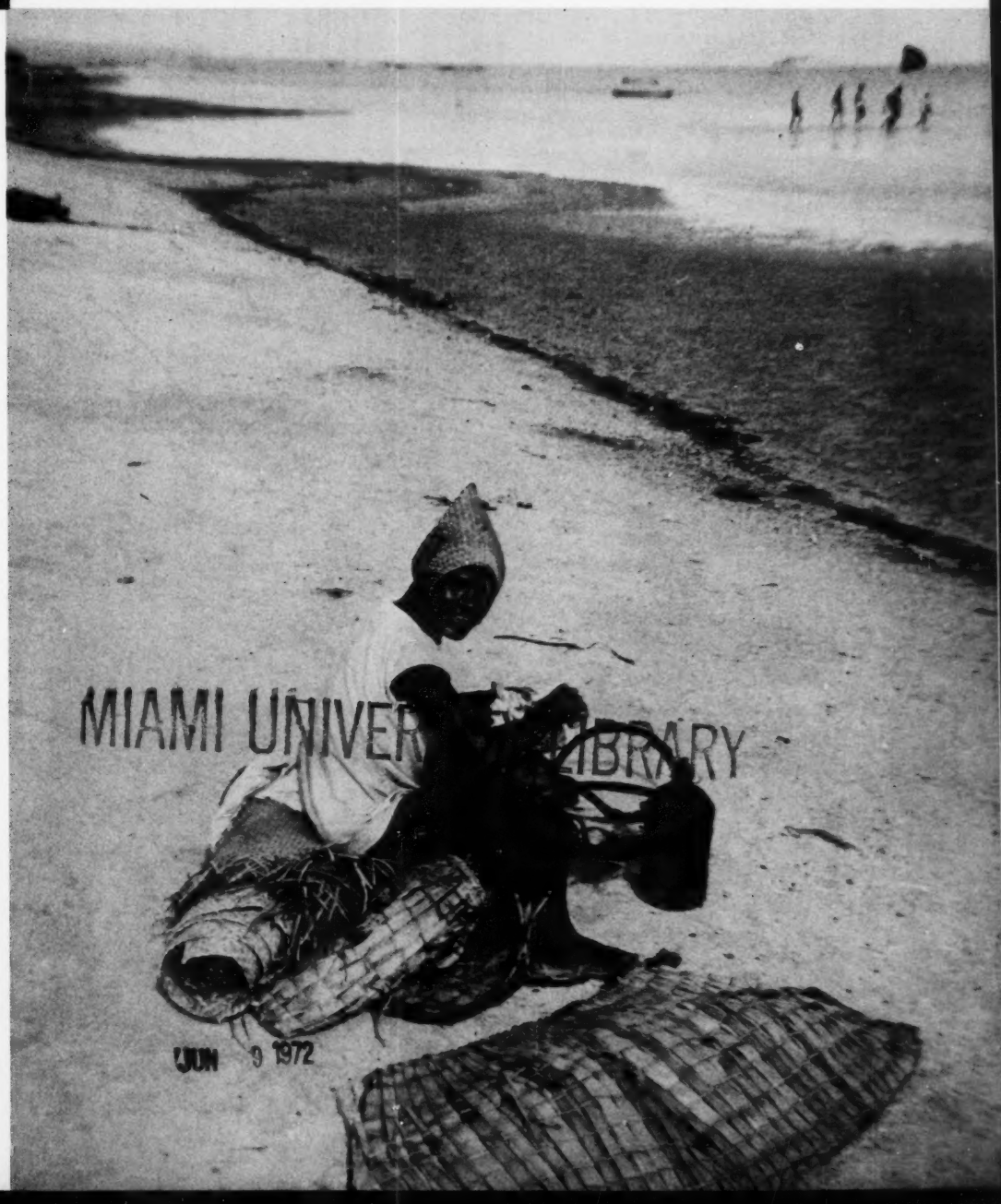
A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

Commercial Fisheries

REVIEW

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service



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Commercial Fisheries REVIEW

A comprehensive view of United States and foreign fishing industries — including catch, processing, marketing, research, and legislation — prepared by the National Marine Fisheries Service.

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COVER: Many Ceylonese fishermen shoot drift nets in the evening, then sleep on the beach until next morning. FAO is working with Ceylon to increase fish supply by more efficient methods.

(FAO Photo)

FISHERMEN'S MEMORIAL—GLOUCESTER, MASS.

U.S. DEPARTMENT OF COMMERCE
Peter G. Peterson, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

National Marine Fisheries Service
Philip M. Roedel, Director

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NOAA HEAD VOWS TO PROTECT MARINE RESOURCES

"Our marine resources--poorly understood, managed hardly at all, threatened on all sides--are among our most priceless assets. We intend that what has happened to the whale shall not be repeated with other species if it lies within our power to prevent it." So ended a speech by Dr. Robert M. White, NOAA Administrator, at the inauguration of an auditorium of the New Bedford Whaling Museum in Massachusetts on April 23.

His inaugural lecture, titled "Whales and Men," limned the rise and fall of the whaling industry and the threat today to depleted species. Its latter part dealt with major problems facing men, marine resources, and the Nation. The lesson of the whale is relevant to the solution of these problems.

The following is excerpted from Dr. White's speech.

We must, in fact, conserve or suffer the consequences. Although it is not a popular thing to say, conservation must begin at home. The concept is not an easy one to accept in the face of the difficulties which today beset New England's fisheries and with the spectacle of foreign fleets gobbling up valuable--and perishable--stocks almost under our noses.

For more than 300 years, men from New England have fished the rich banks off New England for their livelihoods. During these centuries the fishing grounds, although located in international waters, were used almost exclusively by American fishermen. In the early 1960's, huge fleets from the USSR and other nations moved in, bringing modern technology, mass fishing, depletion and hardship. Haddock, cod, herring, the hakes, mackerel and other species have been, and continue to be, heavily exploited. This audience knows the impact better than all others. You suffer double jeopardy. You bear the brunt of the economic hardship that accompanies both bad conservation practices as well as the remedies of drastic quotas necessary to give hope of restoration of resources on which you depend. I speak of the yellowtail flounder, one of the mainstays of New Bedford's fleet today. In recent years this species has declined alarmingly, with the hardships more than evident.

You are faced with a Hobson's choice--some of you think unfairly--to suffer the immediate hardship of quota regulations and to work with us to restore the resource on which the community depends, or suffer in the long run the catastrophe which will result from unregulated take and permanent destruction of the resource. You have a right to expect the support of your Government to assist you in these difficult times. You have the right to expect your Government to represent you and your interests forcefully in international negotiations, and you have the right to expect your Government to insist upon enforcement by all, of such agreements as are arrived at. I will be the first to admit that we have not always been successful. But it is not because we have not tried. And I pledge that we will not cease to exert our every effort.

We face a dilemma. It is a fact that fisheries on the high seas beyond 12 miles, are in international waters. Under present law, they are common property and are subject to exploitation by anybody and everybody. The only mechanism we now have to regulate the take is through the International Commission for the Northwest Atlantic Fisheries. It has not served our national interests adequately, but it is all we have. We are striving in that forum to push for adequate regulations. We seek to move toward national quotas as a means, at the present time, of insuring adequate fish for our fishermen. We have made a start with herring. More species must be brought under quotas soon.

This kind of regulation may save the stocks but not necessarily American fishermen, for those nations whose recent efforts have depleted the stocks still will be able to take a major share. In our view, the problem will not approach solution until the coastal nation has a much greater degree of control over coastal fishery stocks, and a preferential share of the yield of those stocks. We have expressed our views vigorously in support of coastal Nation control of coastal stocks at the most recent preparatory meeting for the United Nations Law of the Sea Conference to be held in Geneva in 1973. NOAA and its National Marine Fisheries Service are deeply involved in planning for the conference, and we are determined to seek a U.S. position which will bring an end to the systematic overexploitation of resources on which our people depend.

We are also deeply concerned about environmental deterioration and its effects upon the living things of the sea. The practice of dumping polluted materials in the ocean has had serious consequences. Clams, bay scallops, and oysters, limited essentially to coastal waters, are especially vulnerable and deserve the best protection we can offer them. Even more important is the continuing decline of water quality in our estuarine and coastal environments, and its effect upon their capacity to produce the things we need. Man has physically damaged these environments through thoughtless dredging, filling and bulkheading, thus removing vital nursery areas. I wish very developer along the United States coastline could be made somehow to realize that two-thirds of all our coastal species spend at least part of their lives in our bays and estuaries.

Nevertheless, there are hopeful signs. Officialdom, at least, is becoming painfully aware of the fact that the coastal zone has a multiplicity of use, and one of the most important is as a habitat for valuable commercial fisheries and a source of recreation. It is becoming quite clear that coastal zone management mechanisms must be found and put into practice to properly balance the uses to which we put this vital area.

When NOAA was created in October, 1970, President Nixon charged us with a major environmental mission. Chief among our tasks are the exploration and description of the oceans, their basins, and their life forms and resources, achieving a better understanding of their processes, and supporting the technological advances necessary to effective and protective use of the seas.

Our marine resources--poorly understood, managed hardly at all, threatened on all sides--are among our most priceless assets. We intend that what has happened to the whale shall not be repeated with other species if it lies within our power to prevent it.

FOOD PRICES MAY RISE 4½% IN 1972

"Food prices in 1972 may average 4½% higher than in 1971, up from the 3% increase last year," predicts the U.S. Department of Agriculture. Contributing most of this increase will be the continued large increases in disposable income and a leveling of food supplies.

The prices of food for the home "will rise close to 4% compared with the 2½% boost in 1971."

Fishery Products Situation

Supplies of fishery products generally have been tight at the markets during the past few years. The situation continued in 1971. The dock strikes in late 1971 made things worse. They disorganized normal distribution and discouraged exports by foreign suppliers. Revaluation of foreign currencies favors shipment of available world supplies to overseas markets. This may cut even more the availability of seafoods in the U.S. So, per-capita consumption, down in 1971, "may do well to hold steady in 1972."

Because prices soared to records in 1971, the value of per-capita sales continued strong. This was true especially for shellfish, particularly shrimp, lobster, lobster tails, crab, and scallops. Scallops remained popular at retail and institutional levels. The only major weakness was in retail sales of such basic fish commodities as fillets, steaks, and breaded fish sticks and portions.

Demand Strong

Another large rise in prices is indicated in 1972 because the continued strength in demand will keep ahead of supplies. However, due partly to Phase II of the government's economic policy, "the increase probably will be smaller than in 1971."

The institutional market, too, remains strong. Fast growth is expected in fish sandwiches, fish and chips, and similar items used mainly by food-service operations.

Supplies Tight

Supplies will remain tight. At the start of 1972, inventories of frozen fishery products were below a year earlier. In the early months of the year, domestic production is seasonally low; imports are expected to run below a year ago.

FDA PROPOSES NUTRITIONAL VALUES BE PUT ON PACKAGED FOOD LABELS

U.S. consumers will be able to determine from packaged-food labels the nutritional values of the contents, including vitamins, minerals, proteins, and calories, under a proposal made March 29, 1972, by the Food and Drug Administration (FDA). It appeared in the Federal Register the next day.

The FDA Commissioner said that if industry adopted and carried out the new program, it "could provide one of the most fundamental changes in the history of food labeling in this country. . .In the past, labeling emphasis has been on identifying the product and its ingredients. The new program encourages labeling emphasis on the identity of nutrient values." The FDA program is voluntary.

Type of Information

The proposal outlines the format and type of nutrient information manufacturers must make available (and position on the label) if they want to join the labeling program. Tests showed that consumers want and will use better information on nutrients.

Recommended Daily Allowance

The Recommended Daily Allowance (RDA) will serve as the standard for nutrient values on the labels. The RDAs are amounts of nutrients recommended by the Food and Nutrition Board of the National Research Council. They are considered adequate to maintain good nutrition in healthy persons in the U.S. The allowances are revised as newer knowledge of nutritional needs accumulates.

The declaration on the label must include this information according to the stated serving or portion:

1. Caloric content to the nearest 5 calorie increment;
2. Number of grams of protein, fat, and available carbohydrates to the nearest gram;
3. Vitamins and minerals expressed in 10% increments of the RDA (5% increments may be used up to 20%). The statement, "Contains no significant quantities of vitamins and minerals," may be used

if product contains less than 5% of any vitamins or minerals required to be listed; and

4. The listing must include Vitamin A, Vitamin C, Thiamin, Riboflavin, Niacin, Calcium, and Iron. Mention of other vitamins and minerals is optional.

NMFS NAMES CHIEF OF STATE-FEDERAL RELATIONS

NMFS has appointed Takashi Miyahara, 46, of Seattle, Wash., Chief of its Office of State-Federal Relationships (OSFR). He will plan and administer State-Federal cooperative efforts to develop and implement new concepts in managing commercial and recreational fisheries. He will direct the NMFS $6.5 million grant-in-aid program.

NMFS Director Philip M. Roedel noted the long-established need for more rational systems to manage U.S. fishery resources. The new State-Federal Fisheries Management Program is intended to create and encourage such systems.

To develop programs and policies for solving management problems of mutal concern, Miyahara will represent NMFS in contacts with Congress; State and Federal officials, including State legislative bodies; officials of scientific organizations, and commercial and recreational fishing groups.

Background

Miyahara worked for the Bureau of Commercial Fisheries (now NMFS) from 1953 to 1962. He resigned to join Wakefield Fisheries of Alaska as general superintendent for about nine years. Wakefield was the pioneer and largest king-crab processor in the U.S. until its merger with Hunt-Wesson Foods. Frequently, he testified at fishery regulation hearings and participated in international negotiations.

After leaving Federal Service, he was asked to continue his association with scientists on the U.S. Section of the King Crab and Tanner Crab subcommittee of the International North Pacific Fisheries Commission. On several occasions he served as chairman and spokesman for the subcommittee. Also, he worked with the Alaska Department of Fish and Game and the Alaska Legislature on the State's king-crab program.

Miyahara holds a B.S. degree in fisheries from the University of Washington, Seattle. He is a member of the American Institute of Fisheries Research Biologists.

U.S. AND CANADIAN LOBSTER RESEARCHERS MEET

U.S. and Canadian lobster researchers met at the NMFS Biological Laboratory in Woods Hole, Mass., March 28-29, to review both current research and progress since their last meeting in St. Andrews, New Brunswick, in 1970.

Researchers know that seawater temperature and available food are the primary factors affecting the growth rate of juveniles and young adults. They are seeking the information necessary to induce a greater ratio of internal growth with more frequent moulting. Also, they would like to increase the size increment resulting from each moulting. These aspects of lobster culture have direct application to the commercial rearing of lobsters.

Distinct Stocks of Lobsters

The study of lobster growth patterns is especially important in estimating productivity rates of lobster populations. The separation of the lobster resource into distinct stocks, each with a different growth rate, will help to clarify some aspects of the total productive capability of natural lobster populations. Understanding this capability is important in maintaining profitable commercial fishing operations.

The meeting was held at the NMFS Northeast Fisheries Center in Woods Hole, although the Center's lobster research is conducted at Boothbay Harbor, Maine. Boothbay Harbor scientists reported on the results of their lobster-tagging program. This program is important in "determining the extent,

seasons, and areas of mixing between New England offshore and coastal lobster populations."

The coordinator of the workshop was Ernest D. McRae Jr.

GRAY-WHALE CENSUS SHOWS 15% DECLINE

The annual count of the southward-migrating gray whales, Dec. 18, 1971-Feb. 8, 1972, was conducted at Yankee Point near Monterey, Calif. Richard Fletcher and Ella Mae Zeman counted 2,740 whales passing between 7 am and 5 pm daily. Forty more whales were seen that already had passed the point by 7 am or had not reached it by 5 pm. Total population--including whales that passed at night or were missed by the observers during poor visibility--is estimated at about 9,000.

Possible Reasons for Decline

This year's count was about 15% below the previous 4 years, 1967-68 to 1970-71. The reasons are unknown. NMFS La Jolla suggests that these possibilities be investigated: 1) increased boat traffic in Monterey Bay area may be causing a larger proportion of the whales to migrate farther offshore; 2) Eskimos in Siberia and Alaska may be killing more whales; and 3) increased tour-boat traffic in Scammon's Lagoon, one of the whale's major Mexican calving grounds, may be reducing the survival rate of calves. The lagoon is south of the Bay of Sebastian Vizcaino on the west coast of Baja California.

Mexico Establishes Sanctuary

By presidential decree, effective in early January 1972, Mexico established a refuge for whales in Scammon's Lagoon.

SAN PEDRO NO. 1 IN LANDINGS VALUE, CAMERON, LA., IN VOLUME

San Pedro, California, retained its position as No. 1 fishing port during 1971 in value of landings--but Cameron, La., replaced it in volume.

Many of the same seaports remained among the top 10 in value of catch to fishermen and in pounds landed. None of the 10 occupies the same position on both lists.

The leading ports by value of landings were San Pedro, Calif.; Brownsville-Port Isabel, Tex.; Kodiak, Alaska; New Bedford, Mass.; Aransas Pass-Rockport, Tex.; Dulac-Chavin, La.; San Diego, Calif.; Freeport, Tex.; Cameron, La.; and Morgan City, La.

Tuna is the primary species landed at San Pedro; menhaden accounts for most landings at Cameron.

The port rankings by volume in 1971 were Cameron, La.; San Pedro, Calif.; Pascagoula-Moss Point, Miss.; Dulac-Chavin, La.; Morgan City, La; Empire, La.; Kodiak, Alaska; Gloucester, Mass.; New Bedford, Mass.; and San Diego, Calif.

WASHINGTON-OREGON SALMON PACK ROSE SHARPLY

Preliminary estimates of the 1971 Washington-Oregon canned salmon pack indicate 615,550 standard cases (48 one-pound cans per case). This is an increase of 357,900 cases (139%) over 1970. Dominating the 1971 pack was Puget Sound sockeye salmon: 251,483 cases, 41% of total.

The canned pack of sockeye salmon in Puget Sound was up to 50% above the cycle year 1967 pack.

The 1971 Puget Sound pink-salmon pack of 146,800 cases was slightly less than double the 1969 cycle year pack of 75,857 cases.

In Puget Sound, pink salmon are 2-year-olds when they return from the ocean to spawn; sockeye salmon are 4-year-olds when they return. Puget Sound pink-salmon runs occur only in odd-numbered years.

1971 GULF MENHADEN CATCH SETS RECORD

The menhaden catch in the Gulf of Mexico broke all records in 1971--over 1½ billion pounds were landed in Mississippi, Louisiana, and Texas. It was the largest catch of a single species in U.S. history. Menhaden, primarily, is an additive in meal fed to poultry and cattle.

MORATORIUM ON NORTHERN STOCK OF PACIFIC SARDINE RECOMMENDED

The "catastrophic decline" in California sardines in the late 1940s motivated establishment of the California Marine Research Committee (MRC). MRC coordinated U.S. and state research on sardines.

On Feb. 8, 1972, MRC recommended a moratorium on the northern stock of Pacific sardine. Although this stock is very important to commercial and sport fish industries of California, MRC said, data from CalCOFI indicated it was at extremely low level. Drs. W. Lenarz and P. Smith of NMFS La Jolla Laboratory provided some of the data.

MRC Recommends Legislation

MRC asked the Director, California Department of Fish and Game, to initiate appropriate legislation in the 1972 regular session of the California Legislature. It asked the U.S. State Department to join with Mexico to enact a moratorium on northern stocks of Pacific sardines off west coast of northern Baja California, Mexico.

REVIEW PACIFIC NORTHWEST COASTAL-POLLUTION STUDIES

Six Oregon State University scientists have compiled a review of all oceanographic literature on the coastal zone from Cape Flattery, Wash.; to Cape Mendocino, Calif. It is entitled, "Oceanography of the Nearshore Coastal Waters of the Pacific Northwest Relating to Possible Pollution." The first volume contains a bibliography and 21 chapters on the physical, biological, and chemical characteristics of the northeastern Pacific. The second volume contains charts and tables. The report excludes studies on bays and estuaries.

Available From GPO

The report was prepared with a grant from the Water Quality Office of the Environmental Protection Agency. It is part of the water-pollution-control research series sponsored by the Water Quality Office. Copies are available through the U.S. Government Printing Office for $11.25.

NMFS ALASKA HOLDS POT FISHING WORKSHOPS

Nearly 200 fishermen, businessmen, and students came to a series of informal workships designed by NMFS Alaska Region to demonstrate assembling and fishing techniques of pots for sablefish and other bottomfish. The workshops were held in Homer, Seward, Sitka, Petersburg, and Ketchikan in January. Components of the pots, preshipped to the workshops, were assembled with audience participation. The completed pots, ready to fish, were left with fishermen at each location. The fishermen will experiment with them on various species. Results of the test fishing will be made available to other interested fishermen.

Extension Program

The workshops were part of the NMFS Alaska fisheries extension program. Fred Hipkins, fishing-gear research specialist, from Seattle, Wash., demonstrated and supervised pot-assembly methods. He discussed experiments, evaluation, and fishing experience with the pots on black cod in Washington and Oregon waters.

The purpose of the workshop was to expose fishing communities to relatively inexpensive gear that, potentially, can be used by independent fishermen to catch underutilized bottomfish resources. This purpose was explained by NMFS Alaska coordinator, Walter Jones, who arranged the workshops.

A step-by-step description of pot construction (6 and 8 foot), with a materials list, will be written by Fred Hipkins for distribution to workshop participants. Information on NMFS experimental fishing with pots off Alaska during sablefish tagging in February will be provided fishermen.

Can Catch Other Bottomfish

NMFS staff emphasized that the pots would fish bottomfish other than sablefish, such as cod, lingcod, rockfishes, and soles. Many southeast Alaska fishermen are so oriented to salmon, king crab, and halibut fishing that they doubt they can fish for much less than 20 cents per pound. There are markets in all workshop areas offering 8-12 cents per pound (depending on dressed condition) for rockfishes and around 17 cents a pound for true cod (for bait). The market now for sablefish is strong--around 30 cents per pound.

ALASKA FORECASTS 1972 SALMON CATCH

The 1972 catch forecast for Bristol Bay red salmon is grim, that of pink salmon bright, according to the Alaska Department of Fish and Game.

The catch of red salmon in Bristol Bay is predicted at about 5,375,000 fish. This will produce a case pack of about 375,000 standard cases--down 45% from 1971 pack, but slightly above cycle year pack of 335,000 cases.

1972 Alaskan Salmon Catch Forecast
(In Numbers of Fish)

Region	King	Red	Coho	Pink	Chum	Total
			(1,000 Fish)			
So. Eastern	300	800	750	16,500	1,000	19,350
Central	30	2,990	670	12,350	3,080	19,120
Western	280	5,370	170	1,140	1,290	8,250
Total	610	9,160	1,590	29,990	5,370	46,720

An Alaskan pink salmon pack of 1,420,000 cases is predicted, 39% above 1971's 1,017,653 cases. This would be up slightly from the 1970 cycle year pack of 1,329,000 cases.

ALASKA'S SALMON-FISHERY LICENSING SOARS

Alaska requires licenses for fishermen, vessels, and gear. Between 1962 and 1971, only the numbers of purse seines licensed annually remained relatively constant. Those of troll, drift net, and set-net licenses reached record levels in 1970 and 1971. More than 4,000 fishermen entered Alaska's fisheries during the decade.

	1962	1971
Vessels	8,157	10,710
Gear:		
Troll	1,440	2,353
Purse seine	1,402	1,323
Drift gill net	2,895	4,779
Set gill net	2,294	3,062
Fishermen:		
Resident	10,333	14,176
Nonresident	6,072	6,388
Total fishermen	16,405	20,564

Nonresident fishermen make up about 30% of all fishermen. The home state of nonresident fishermen has not been tallied, but the Alaska State Department of Revenue reports that over half of the nonresidents were from Washington State, and one-fourth from Oregon. An estimated 600-700 Californians register to fish in Bristol Bay.

In 1971, only 14 Alaska vessels fished in Washington State waters.

BLOODWORM MAY BE MOST VALUABLE MARINE ANIMAL

On the basis of weight, the bloodworm used as bait by sport fishermen may be the most valuable regularly harvested marine animal.

In 1971, about 845,000 pounds were harvested in Maine. They were worth about $1,250,000 to the diggers, who took the worms from mud flats exposed by receding tides. In recent years, the bloodworms have averaged about 140 to the pound and cost

anglers about $1 a dozen. This is almost $12 a pound if sold by weight.

Because bloodworms are valuable, scientists of Maine's Department of Sea and Shore Fisheries, supported financially by NMFS, are studying causes of mortality in harvesting, handling, and shipping.

TAGGED BLUE SHARK RECAPTURED 2000 MILES AWAY

A 6-foot blue shark, tagged off Cape Cod, Mass., October 1970, was recaptured by a Taiwanese longliner in April 1971. The site was latitude 19°29' N. longitude 43°23' W.--over 2000 miles southeast of tagging site, about half way between the West Indies and Africa. This is the farthest east a tagged shark has moved.

Earlier, a blue shark was recovered from this same area. It had traveled 1800 miles westward from the Canary Islands.

Both sharks were free for nearly 6 months. Their rates of travel were 10.5 and 11.8 miles per day.

U.S. FIRM FLIES EELS TO BRITAIN

A Philadelphia, Pa., firm last fall delivered 70 tons of live eels by air freight to London in less than 12 hours. The mortality rate for such shipments rarely exceed two percent.

The size of the British market was estimated at around 800 tons a year. Most imports are made from December to March, when live eels, mainly from Ireland, are out of season. Frozen eels are imported only when adequate live supplies are not available. American yellow (known in London as brown) and silver-bellied eels are sold in Britain. (Fish Industry Board, New Zealand.)

BASKET COCKLE IS EXPOSED BY OREGON RESEARCHERS

A bay clam common to Oregon, the basket cockle, is having its life history told. It is the result of a 3-year study, begun in 1969, by Oregon State University's Department of Fisheries and Wildlife to learn more about this important invertebrate's biology.

"Harvest regulations are based on a very limited knowledge of the basic biology of this animal. We sought to gain information which would provide a basis for alterations in management practices, where needed, to regulate harvest," said Robert Scott, a research assistant.

"As a near-surface dweller, the basket cockle is easy to harvest with sport gear and in the study area, the sport harvest of clams has been tremendous. As a result, it is not uncommon to find cockles in limited supply in once heavily populated areas in Netarts Bay."

It Is Long Lived

The basket cockle is long lived. It may live as long as 10 to 15 years in Oregon estuaries. Age of cockles up to 2-3 years can be determined on the basis of size. "Older individuals become increasingly difficult to age, because growth patterns become more irregular. Counts of shell 'growth rings' provide no useful indication of age on animals from the study area," Scott notes.

The spawning season is long. Free-swimming larval stages are found in the Bay from early spring to late fall.

Oregon shellfish harvest regulations set daily limit of the first 36 cockles dug, regardless of size.

GULF AND SOUTH ATLANTIC FISHERIES

John P. Wise

In the early 1930s, the Gulf and South Atlantic section of the U.S. coast (North Carolina to Texas) produced only about 10% of the volume and value of the U.S. commercial fishery catch. In recent years, the region has become the most important in terms of total commercial landings--almost two billion pounds a year. This compares with one and a third billion for the northeast coast (Maine to Virginia) and one and a half billion for the west coast and Alaska. Much of the change has been recent--as late as 1950 the Gulf and South Atlantic region produced less than a billion pounds annually (Figure 1).

The dramatic increase in volume of commercial landings has been matched by an increase in value. Nearly 200 million dollars were paid to fishermen for their products in 1970; the figure was well under 100 million in 1950.

Important Salt-Water Angling

The Gulf and South Atlantic states are also important in salt-water sport angling. The population has been growing faster than in most other sections of the country, tourism is increasing, and the good-weather season is long--year round in southern Florida. The result is that over half of the U.S. salt-water sportsmen's catch now is taken in the Gulf and South Atlantic.

Post-1950 Developments

What has happened to commercial fisheries is shown in Figure 2. The traditional mainstays have been menhaden, mullet, crabs, and shrimp. Menhaden landings have tripled since 1950, crabs have more than doubled, and shrimp are up a third. Only mullet have stayed at the same level. Also, a new element has entered the picture--industrial fisheries for reduction and pet food, insignificant in 1950, now take about 100 million pounds a year.

None of these figures include the catch of U.S. shrimpers, mostly from the Gulf coast, who fish far from home waters and land their catches principally in South America. This fishery, brand new since 1960, now produces about 80 million pounds of shrimp a year, almost all exported to the U.S.

The Future

What is the future of the Gulf and South Atlantic fisheries? Biologists of the National Marine Fisheries Service point out that the record menhaden catches in recent years may be close to the maximum the stocks can produce. On the other hand, blue crabs, the most important crab, could almost certainly support increased landings. (Processing and distribution problems are the industry's main headache.) There is evidence that the yield of shrimp in the Gulf of Mexico could be increased by increasing the average size of the shrimp caught. Spiny lobster fisheries are growing rapidly, now at least 10 million pounds a year worth 10 million dollars or more to the fishermen. Snapper fisheries may have a large potential. Even the mullet stocks could probably support a larger fishery; the market has been the limiting factor.

Almost-Untouched Resources

There are two major resources in the region as yet almost untouched. The calico scallop is probably capable of producing some 80 million pounds of high-value meats a year, and herringlike fishes in the Gulf might yield 600 million pounds of fish for reduction each year. Thus it seems likely that the Gulf and South Atlantic region could easily produce something closer to three billion pounds a year than to the two billion pounds presently taken.

Production Can Increase

There is no doubt that fishery production in the Gulf and South Atlantic can and probably will increase--particularly because of the aggressive nature of the fishing industry there. Foreign competition is minor: Mexico takes about 40 million pounds of shrimp a year in

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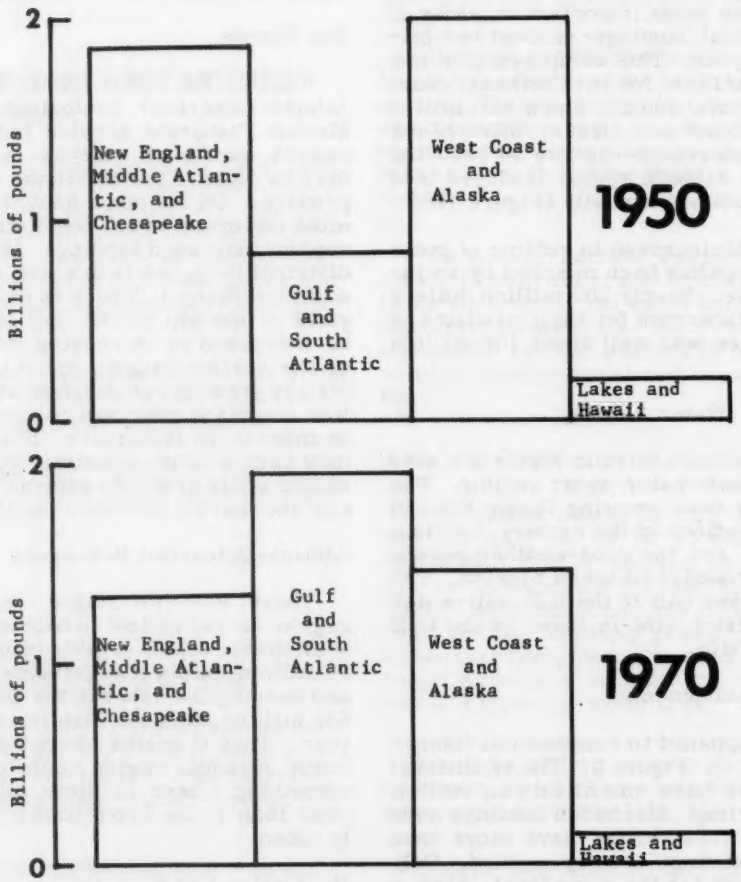


Fig. 1 - U. S. total fishery landings, 1950 and 1970.

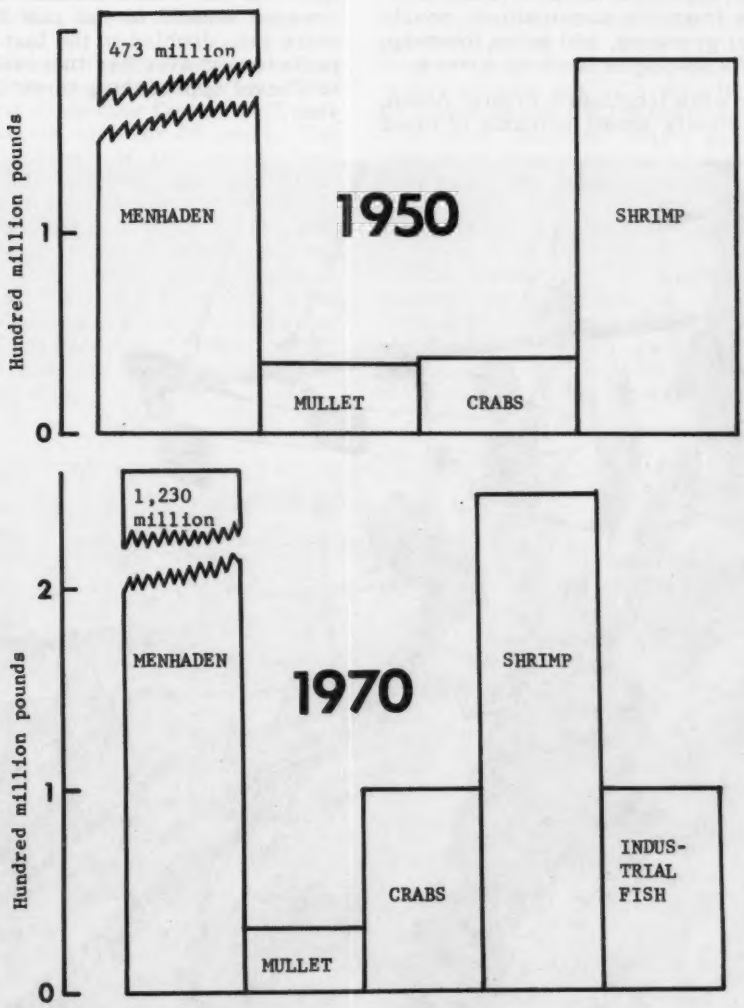


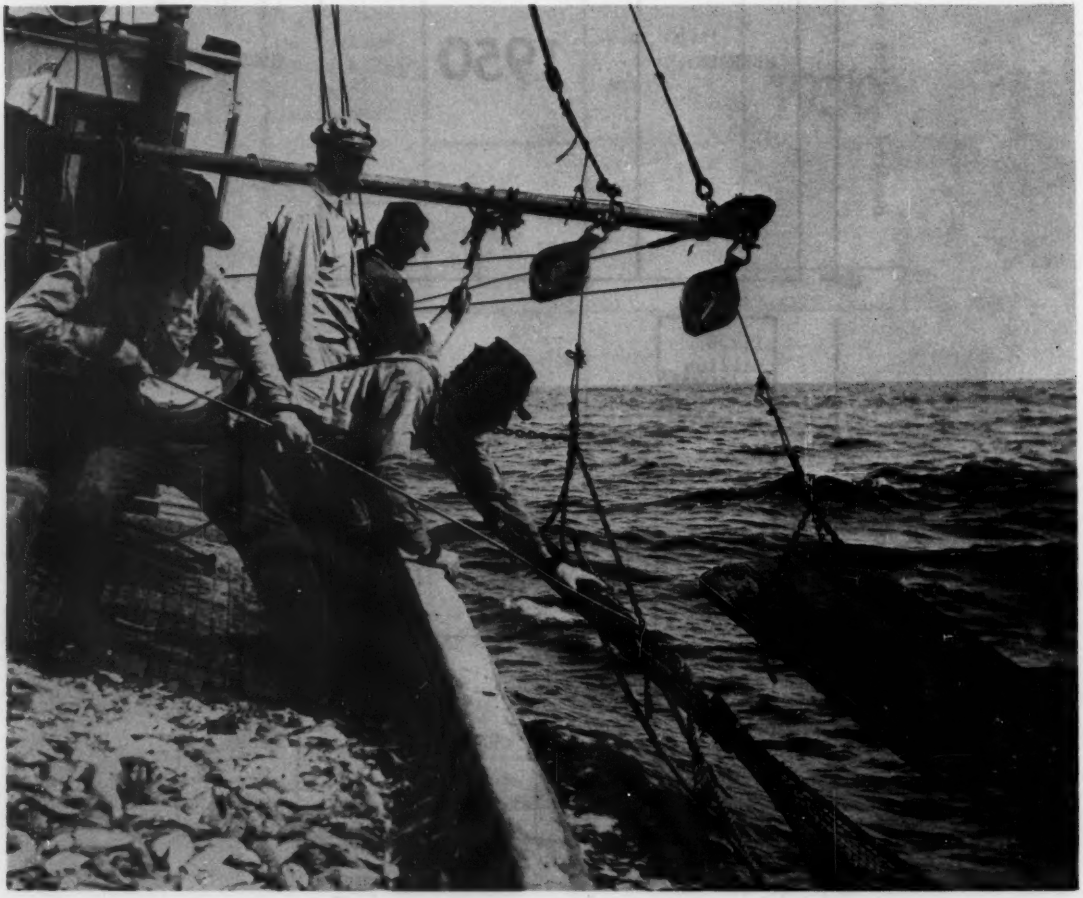
Fig. 2 - Principal Gulf and South Atlantic landings, 1950 and 1970.

the Gulf of Mexico. With the Mexican government's emphasis on fishery development, this fishery probably will increase. (A large part of the Mexican shrimp catch is exported to the U.S.)

Cuba's total catch is now over 170 million pounds a year, more than doubled since 1960. But, to judge from its composition, nearly 60% snappers, groupers, and spiny lobsters, most of Cuba's fishing is in home waters.

Except for a few longliners, mostly Asian, that take relatively small amounts of tunas and billfishes, there are only very minor fisheries in Caribbean, Central, and South American countries, in all the waters from North Carolina to northern Brazil.

In summary, commercial fish catches in the Gulf and South Atlantic region have increased tenfold in the last forty years, and more than doubled in the last twenty. Prospects for even further increases are likely--to a level approaching three billion pounds a year.



Shrimp trawling in Gulf of Mexico off New Orleans. Trawl and otter boards, suspended from outrigger boom, are being lowered back to fish again. Part of last mixed catch of fish and shrimp is on deck. (C.H.B.)

ALBATROSS IV CONDUCTS GROUNDFISH SURVEY OFF EASTERN UNITED STATES

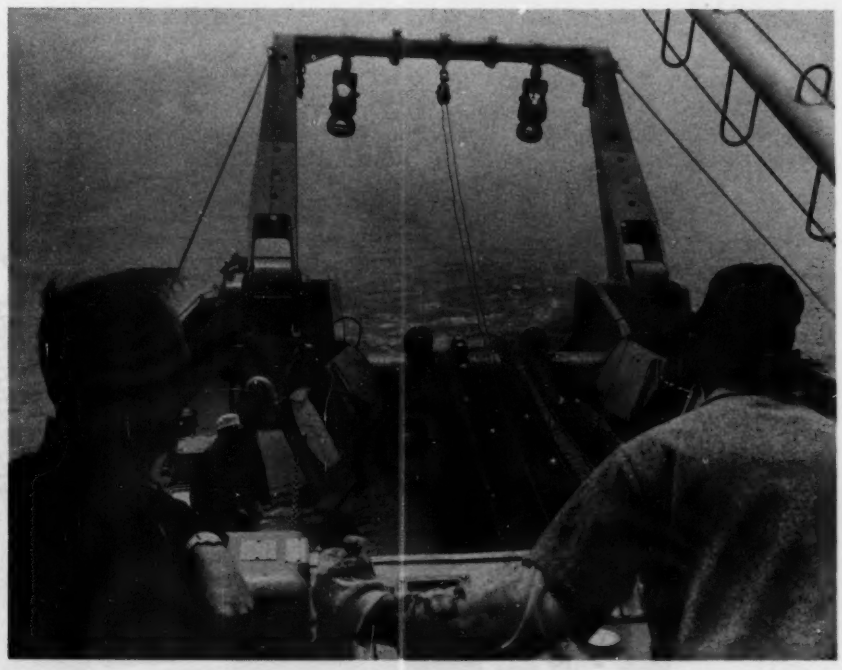
During the fall of 1971, the NMFS research vessel 'Albatross IV' completed surveys of 5 major areas: the continental shelf off western Nova Scotia, the Gulf of Maine, Georges Bank, and shelf areas off southern New England, and the middle Atlantic States.

The groundfish surveys have been an important part of the research program of the NMFS Northeast Fisheries Center at Woods Hole, Massachusetts, for over 20 years. The timing and techniques of the survey have varied considerably. In 1963, when the Albatross IV become available, a fairly standardized approach was adopted. From 1963-1965, three times a year, surveys were conducted from western Nova Scotia to Long Island, New York. Since 1967, the survey area has included the continental shelf southward from Long Island to Cape Hatteras, North Carolina. Current surveys are carried out twice a year, in spring and autumn.

The primary goal of the survey series is to measure changes in the composition of species and the abundance of the fish populations of the continental shelf off the U.S. northeastern coast. The results supplement other information available to develop management policy for conservation under The International Commission for the Northwest Atlantic Fisheries (ICNAF). Recent surveys by Canadian and USSR fishery research agencies have followed NMFS guidelines. The results of these cooperative surveys increase "the precision of interpretation."

How Survey Is Conducted

The evaluation of survey results relies heavily on statistical techniques aided by automatic data processing. The sampling stations are chosen to reflect an accurate measure of the entire area. Primary sampling is done by trawling at stations



Crew of NMFS research vessel 'Albatross IV' retrieves fishery gear off Georges Banks during experimental fishing operations. Vessel has stern trawling ramp, bow thruster to help control it on station, variable pitch propeller, active rudder and closed circuit television. TV shows operations on vessel and trawl and other gear.

selected randomly with a standard #36 Yankee trawl. Measurements of the trawl net during presurvey testing show an average wingspread of 36.5 feet and average headrope height of 8.5 feet. The nets used were equipped routinely with a $\frac{1}{2}$" stretched-mesh liner in the cod-end to retain smaller organisms. Operations are continuous on a 24-hour day basis; trawl hauls are 30 minutes.

Preliminary evaluation of data from the 1971 survey for southern New England and Georges Bank is compared in Table 1 with data from earlier surveys (1965-1970) for several important species.

In Fall 1971, the relative abundance indices (mean catch per haul in pounds) for Georges Bank area was only 52% of average fall survey figure for the 6-year period, 1965 to 1970. Haddock catches dropped most precipitously: The 1971 figure was only 14% of 1965-70 average (down 86%).

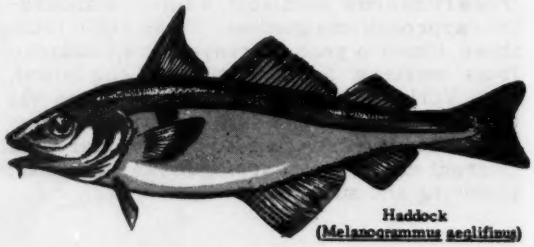
Overall catch rates for southern New England also showed a decline. However, these were off only 17% in 1971 from earlier (1969-1970) data. The catch index for yellowtail flounder was off about 25% for the period.

1971 Results

Some observations on key species include:

HADDOCK

Recruitment to this fishery will remain at a low level until at least 1974. The 1969 and 1971 year-classes appear better than the very



Haddock
(Melanogrammus aeglifinus)

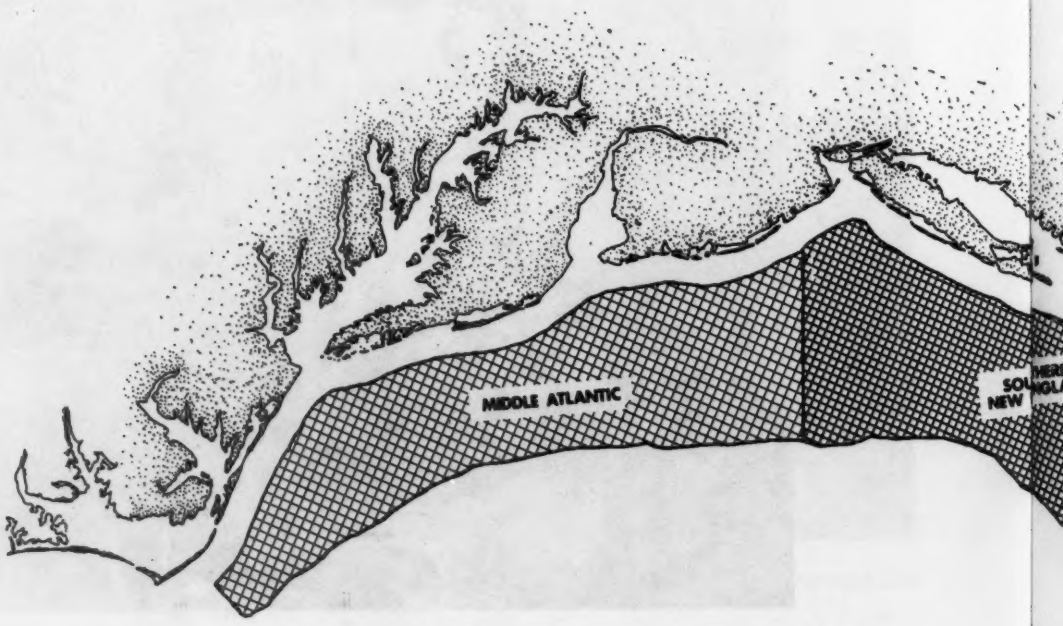


Fig. 1 - Sampling areas in groundfish survey.

poor year-classes spawned since about 1965. But it must be remembered that they are small relative to the average year-classes that supported a much larger fishery in the 1950s. Even though the present level of fishing for it is low, it is very doubtful that the haddock population will be able to do much more than hold its own. The recruitment will not produce any significant build-up of the stock under current quota levels, the NMFS scientists predict.

YELLOWTAIL FLOUNDER

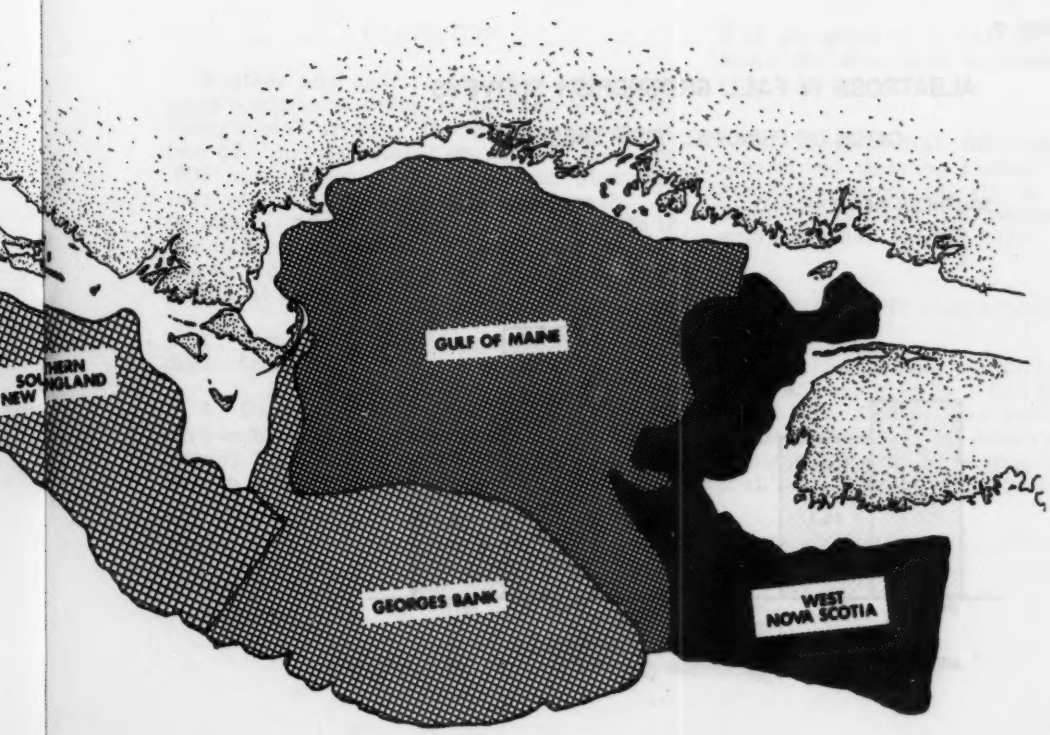
Recruitment of the southern New England yellowtail flounder stock is low. The reduction in quota from 13,000 to 10,000 metric tons in 1972 is essential to maintain the stock. No major increase will be possible until recruitment improves. In 1972, recruitment will remain low.

The Georges Bank yellowtail flounder indices for total stock and recruitment also have shown a decrease. Although the relationship between recruitment and fishable stocks is not yet established for this area, the decline is cause for concern, say MMFS scientists.

Table 1 - Yellowtail Flounder Fall Index of Recruitment

	Relative Recruitment *Index	
Year	So. New England	Georges Bank
1963	16.3	12.7
1964	18.5	2.2
1965	11.7	1.3
1966	34.4	9.9
1967	19.9	7.7
1968	9.0	9.7
1969	7.0	6.0
1970	9.2	5.7
1971	7.7	3.5

*Addition of fish one-year-or-more old to the exploited stock.



SILVER HAKE

Survival of the 1971 year-class was very good: Albatross IV caught hake 10 cm. or less. The greatest improvement was in the Gulf of Maine and on Georges Bank. Abundance of young fish in the Gulf increased about 44-fold from the 1967-70 average; on the Bank, about 7-fold. Catches of young fish in the southern New England-Middle Atlantic area were the highest since 1968--1.7 times greater than the 1967-70 average. This year-class will begin recruiting to the fishery in late 1972. It should become more evident in 1973 and 1974.

Total abundance of the fishable stock of silver hake increased in the Gulf of Maine and southern New England-Middle Atlantic area. It decreased on Georges Bank.

RED HAKE

Survival of the 1971 year-class was better than average. Catches of red hake 10 cm. or less were greater in all areas than in 1970 and most other years. These young-of-the-year on Georges Bank was only slightly less abundant than in 1969, the previous high; 1969 was far superior to any other 1963-70 catches by Albatross IV.

Total abundance of red hake in all areas increased from 1970. Catches in the Gulf of Maine were 5 times greater than the 1967-70 average. The increase was not as great in other areas.

OTHER

Fair catches of redfish were made in the Gulf of Maine. Incidence of copepod parasite infections was low; some redfish catches appeared free of copepods.

Other Collections and Observations

Large series of samples were collected to support detailed studies of age, growth, and food habits of principal species. Observations of maturity indicated pollock were approaching spawning, cod were just starting to develop, and haddock generally were still in resting stage. This order of development is as expected for the fall season.

FIGURE 2

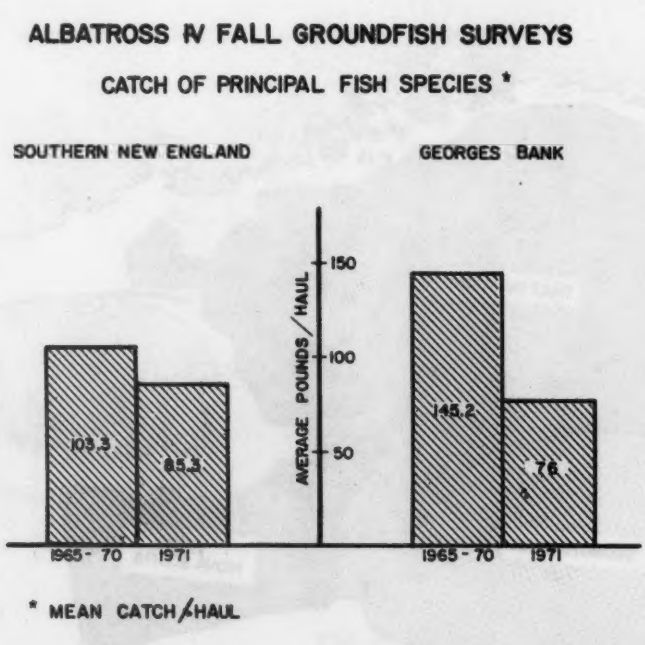


Table 2 - Relative Abundance Indices (Mean Catch Per Haul in Pounds) of Groundfish in Southern New England and on Georges Bank During Albatross IV Fall Surveys

Species	So. New England			Georges Bank		
	65-70	"71"	1971 Catch in Percent of 65-70 Average	65-70	"71"	1971 Catch in Percent of 65-70 Average
Haddock	0.9	0.2	22	45.4	6.4	14
Cod	3.0	0.3	10	11.3	8.3	73
Silver Hake	9.4	10.0	106	3.5	2.3	66
Red Hake	8.9	8.0	90	3.0	4.4	147
Yellowtail	24.1	17.7	73	12.2	10.4	85
Winter Flounder	4.2	1.9	45	6.4	2.6	41
Other Flounders	5.6	2.9	52	4.4	3.0	68
Butterfish	7.4	12.8	173	1.1	2.4	218
Scup	1.5	0.5	33	-	-	-
Goosefish	7.3	3.2	44	6.0	1.6	27
Skates	12.1	14.6	121	32.7	18.6	57
Miscellaneous (all other sp.)	18.9	13.2	70	19.2	16.0	83
Total (all sp.)*	103.3	85.3	83	145.2	76.0	52

* Exclusive of invertebrates and spiny dogfish.

PLANKTON

Routine and special plankton collections were completed using a standard MARMAP "bongo-net" array. The array consists of two 60 cm. diameter nets of .333 mm. and .505 mm. mesh, and two 20 cm. diameter nets of .253 mm. and .366 mm. mesh. An oblique plankton tow from 50 meters depth to the surface was made at each trawl station. These collections support studies in three principal categories:

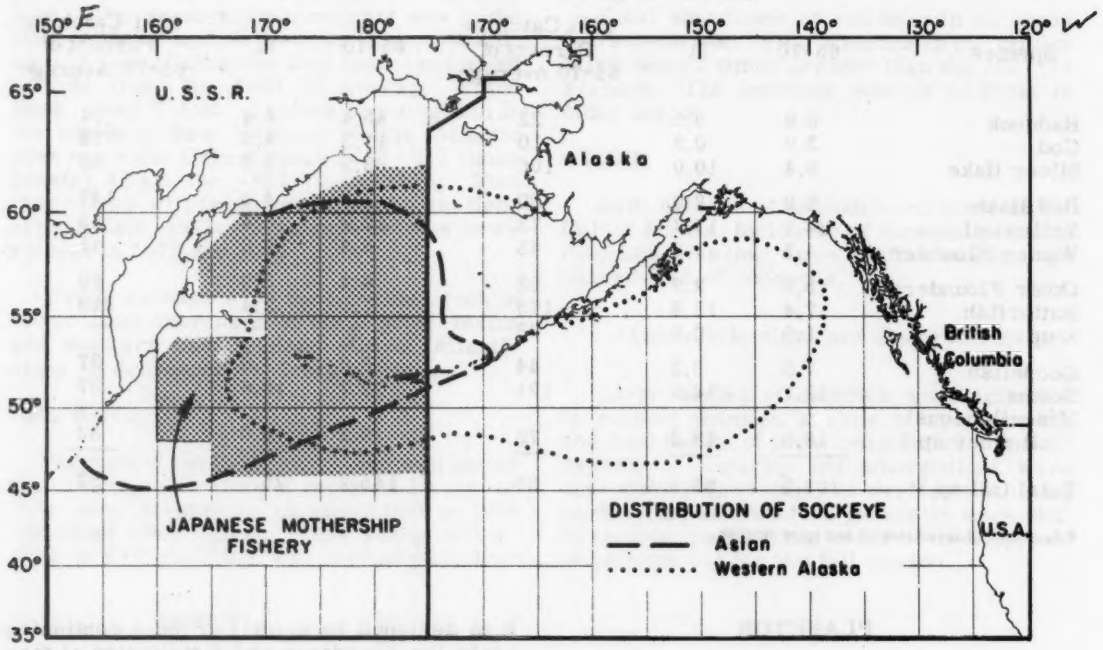
1. Monitoring of fish egg and larval abundance from Cape Hatteras to Nova Scotia.

2. Preoperational evaluation of specialized techniques being developed for MARMAP Survey I. This will be a comprehensive survey in waters contiguous to North America. It is designed to monitor on a continuing basis the abundance and distribution of marine resources.

3. Supplemental information for the International Herring Larval Dispersal Study completed cooperatively by French, Soviet, West German, and U.S. research vessels and scientists during Fall 1971.

AUTOMATIC DATA LOGGER TRIALS

A portable Data Acquisition System (PODAS) supplied by NASA Mississippi Test Facility (MTF) was used for the entire groundfish survey on Albatross IV to record automatically 22 hydrographic, meteorological, and ship-operating factors.



An example of research findings on the ocean distribution and intermingling of Pacific salmon is shown on the map. Here is a generalized summary of the distribution and intermingling of Asian and western Alaskan sockeye salmon. It is based on data from tagging and racial studies, catch statistics of commercial fisheries, and fishing surveys of research vessels. Most findings were made by scientists of the Fisheries Agency of Japan, NMFS, and the Fisheries Research Institute, University of Washington, under NMFS contract.

The shaded portion of map indicates fishing areas of Japanese mothership fleet. The heavy line along eastern border of shaded area is provisional abstention line established by International North Pacific Fisheries Convention.

JAPANESE MOTHERSHIP SALMON FISHERY MEANS RESEARCH FOR NMFS

A mothership fleet that has sailed each spring for nearly 20 years from Hakodate, Japan, to fish Pacific salmon has affected significantly the research program of the NMFS Northwest Fisheries Center, Seattle, Wash. So, too, has the International North Pacific Fisheries Convention. Scientists at the Center and from other groups have worked with their Canadian and Japanese counterparts to conduct research related to salmon stocks in the vast mothership fishing area and to important convention provisions. Convention members are Japan, Canada, and the U.S.

During the 1930s and early 1940s, a fleet of up to 19 motherships and 305 catcher-boats fished salmon just outside territorial waters off Kamchatka's east and west coasts. Maximum annual catches were near 12 million salmon--mostly sockeye (39%), chums (32%), and pinks (27%).

In 1936 and 1937, Japanese vessels sought and caught salmon off Alaska in the eastern Bering Sea, not far from the mouth of Bristol Bay. This Bay is the major producer of North American sockeye salmon. The U.S. protested strongly and the Japanese ended those exploratory operations. When World War II began, Japan suspended all high-seas salmon fishing; it resumed in 1952.

Fishing Areas

For a few years, fishing was limited to the western North Pacific Ocean, between 155° E and 175° E. Then it expanded westward to the Okhotsk Sea, 1955-58, and, in 1956, eastward in the North Pacific Ocean and Bering Sea to 175°W. Since 1959, the fleet has fished this area: 160° E on the west, 46° N on the south, 60° to 62° N on the north, and 175° W on the east.

Size, Fishing Gear, & Operation

Since 1962, the mothership fleet has remained 11 motherships and 369 catcher-boats; in 1952, it was 3 motherships and 57 catcher-boats; the peak was in 1956-59: 16 motherships and 460 to 500 catcher-boats.

The motherships are owned by large companies. The vessels range from 7,000 to 12,000 tons, are capable of canning 100 to 200 tons of salmon a day, and freezing another 40 to 160 tons. (Freezing capacity varies inversely with canning capability.) They carry about 400 persons, including 2 inspectors from the Fisheries Agency of Japan, a company biologist, and a Russian-speaking interpreter. Each mothership is accompanied by 30 to 35 catcher-boats. The latter, generally owned independently, are in the 80-ton class, usually of steel, and carry crews of about 20. Motherships and catcher-boats also fish other species when not catching salmon.

3,000-3,800 Miles of Gillnet

West of 170° E in the mothership fishing area, each catcher-boat may fish 264 tans (8.2 miles) of gillnet each day. East of 170° E. the maximum gillnet length is 330 tans (10.2 miles). So, when it is desired, the fleet of 369 catcher-boats can fish 3,000 to 3,800 miles of gillnet. "Two sizes of mesh are used in the gillnets: 121 mm (4.8 inches) and 130 mm (5.2 inches), stretched measure. Up to 40% of a string of net can be of the smaller mesh west of 170° E, and up to 60% east of 170° E."

Fishing Season

The fishing season usually begins around May 20 and ends between July 15 and August 10. The closing date depends on when the fleet has caught the quota agreed upon during annual meetings of the Japanese-Soviet Commission for Fisheries of the Northwestern Pacific Ocean. On any one day during the season, only 1 mothership with its 30 to 35 catcher-boats (or equivalent) can fish in any one of 169 subareas designated by the Japanese Fisheries Agency for controlling fishing. Average size of subareas is about 5,600 square miles (70 miles north to south by 80 miles east to west).

INPFC-RELATED RESEARCH

The eastern boundary of the fishing area is the provisional line established by the Protocol to the International North Pacific Fisheries Convention (INPFC). This implements the Convention's abstention provisions concerning salmon. The salmon-abstention

provisions have been in effect since the Convention was implemented in 1953. Under them, Japan abstains from fishing salmon east of 175° W in the North Pacific Ocean and Bering Sea; Canada abstains east of 175° W in the Bering Sea. And Canada and the U.S. must provide evidence that their salmon stocks are being fully utilized, scientifically managed, and under extensive research to determine the conditions necessary to achieve and maintain maximum sustained productivity.

Also, the Convention Protocol requires the three members to conduct research to determine areas and extent of Intermingling of Asian and North American salmon. Such information is needed to decide whether a longitudinal line or lines other than the provisional line at 175° W would divide salmon of the two continents more equitably.

Large-Scale Research

In the mid-1950s, Canada, Japan, and the U.S. began large-scale research related to the Protocol problem. The prevailing hypothesis in the U.S. prior to the early 1950s was that salmon in their marine life were confined essentially to continental shelf areas. Research by the NMFS Northwest Center and its contractors has proved that the 5 principal species of North American salmon typically inhabit the high-seas waters of the subarctic North Pacific Ocean. Now it is common knowledge that salmon originating in Asian streams migrate as far eastward as western Gulf of Alaska; also, that North American salmon migrate as far west as Attu or the Komandorskie Islands.

The studies have provided a reasonably complete picture of the intermingling of most major stocks of Asian and North American salmon. The scientists now are able to make fairly accurate estimates of the numbers of North American salmon caught by the mothership fishery.

Salmon-Stock Abstention

Also, U.S. scientists have collected and analyzed much data on the qualification of U.S. salmon stocks for abstention. Demonstrating the qualifications of U.S. salmon stocks for abstention is important. Removing a stock from the Convention's abstention list would remove the protection given it by the abstention line at 175° W. Even with the abstention line, many salmon of western Alaska origin--mostly Bristol Bay sockeye--are caught by the Japanese. However, the abstention line generally provides much protection for North American salmon--practically 100% for all stocks other than those originating in western Alaska. During 1954-70, 1,337 billion North American salmon were caught; the estimated Japanese catch was about 44 million fish, 3% of total.

Bristol Bay Sockeye

Research on the Protocol problem was completed in the early 1960s. Then research of the Center and its contractor, the Fisheries Research Institute, focused on forecasting the strength of Bristol Bay sockeye salmon runs through high-seas research. The scientists also examined the relation between Bristol Bay sockeye salmon abundance and the dynamics of the ocean current systems in the subarctic region. The latter yielded a detailed description of seasonal changes in transport and flow between North Pacific Ocean and Bering Sea. And this information has provided provisional hypotheses about the spawning migration patterns of Bristol Bay sockeye.

Center Researchers

Dr. Francis Fukuhara is scientific coordinator of U.S. Section of INPFC and director of Center's Division of Marine Fish and Shellfish. His division has three major teams that conduct salmon research for U.S. Section:

1. Dr. Felix Favorite heads an oceanography group. It surveys North Pacific Ocean and Bering Sea.

2. Robert French heads a team that surveys distribution of salmon on high seas. The two teams collaborate to study influence of oceanic features on distribution and migration of salmon at sea.

3. The third team is a scale unit headed by Richard Major. It uses scales from the fish body to study age, and it uses scales to determine the natal origins of salmon taken on the high seas.

Personnel of the Division of Fisheries Data and Management Systems, directed by R. A. Fredin, study catch statistics of the Japanese catch of U.S. salmon.

GRAVEL SYSTEM HOLDS PROMISE FOR SALMON FRY INCUBATION

Robert M. Burnett

Fishery biologists think the female salmon may know what she's doing when she buries her eggs in gravel, so they're experimenting with the same method at the Auke Creek hatchery near Juneau, Alaska.

Designed to find ways of improving hatchery production, both in quantity and quality, the experiments at Auke Creek utilize a "back to nature" concept which departs considerably from traditional methods of rearing fish from eggs to fry. Instead of incubating eggs in flat trays in the usual manner, scientists at Auke Creek have mixed the eggs in gravel up to three feet deep. This provides a more natural environment and produces fry which are stronger than those reared in trays.

The Auke Creek hatchery was built and is being operated under a cooperative agreement involving the National Marine Fisheries Services (NMFS), the Alaska Department of Fish and Game and the Territorial Sportsmen.

"Cooperative agreements such as this can play an important role in the development of the fisheries of Alaska," said Robert Roys, director of the Division of Fisheries Rehabilitation, Enhancement and Development of the Department of Fish and Game. "By sharing funding and personnel, the agencies involved can achieve their common objectives at less cost and without duplication of efforts."

At Auke Creek, for example, the Territorial Sportsmen provided the land, the Department of Fish and Game purchased the equipment and provided technical assistance and the National Marine Fisheries Service renovated the building and is supplying the senior biological talent to operate the project.

The Auke Creek hatchery will be capable of producing at least one million fry annually when completed. Initial work is with pink salmon because the two-year cycle of this species permits quick evaluation of results.

"Basically, we're trying to find a way to produce the most quality fry in the least space and with the minimum amount of water," says Jack E. Bailey, NMFS project leader at the hatchery.

"We have found that the tray-reared fry are not as strong as wild fry because they use large amounts of energy in movement and in efforts to remain upright. By burying the eggs in gravel, we duplicate as nearly as possible the natural egg nest and this produces stronger fry," Bailey notes.

He explains that the fry hatch in the small spaces between the pieces of gravel and remain there until fully incubated. The gravel supports them and they are thus less inclined to spend energy in movement. More of the yolk is utilized for growth and the result is a healthier, stronger fish which is better able to withstand the rigors of ocean life.

The concept of incubating salmon eggs in a carefully controlled gravel environment has been under study for several years by the National Marine Fisheries Service and the Fisheries Research Board of Canada. NMFS tests have shown that the gravel boxes can produce five to 10 times as many fry as could be expected from the same number of eggs in natural spawning beds.

Similar incubators developed by R. A. Bams in British Columbia have yielded a six-fold advantage over natural production of pink salmon.

The Auke Creek experiments is utilizing both NMFS boxes and Bams boxes, plus the normal hatchery tray method. Fish hatched in the three incubation systems will be compared with natural pink salmon fry from Auke Creek to determine which gives the best production.

The author is Chief Information Officer, Alaska Department of Fish and Game. Article appeared in Department's 'Alaska Fish Tales and Game Trails'.

Evaluation of the incubator test results in the spring of 1972 will be on the basis of survival from eyed eggs to emergent fry, fork length of preserved fry, wet weight of preserved fry, timing of emergence, state of development at time of emergence and energy reserve of emergent fry.

While studies of fry quality and quantity are important, the final test will be the number of adults which return from eggs incubated at the hatchery. Such a study of adult returns will require the release of at least one million fry, but the natural run of pink salmon in Auke Creek will not provide enough eggs for such a study now. For this reason, present plans call for evaluation of the systems on the basis of fry quality only while the Auke Creek pink salmon run is being built up to the point that it will support a full-scale test.

"Our experiments began last fall when eggs were taken from 170 pink salmon which had entered Auke Creek to spawn. These eggs were fertilized with sperm from an equal number of males; and then incubated to the eyed stage in trays and baskets," Bailey said.

The eyed eggs were then placed in the incubation boxes between layers of gravel.

"The 170 females which supplied the eggs accounted for about one-sixth of the potential natural egg deposition in Auke Creek," Bailey said. "But if the gravel incubators function satisfactorily, the eggs from those 170 females could return as many fish to Auke Creek as will return from the other 926 females which spawned naturally in the stream."

The current test is utilizing two NMFS boxes and two Bams boxes, plus the standard hatchery incubator.

Both types of gravel incubators are four feet by four feet by three feet deep. The Bams boxes utilize a system of perforated pipes and layers of gravel to distribute the water while the NMFS box uses a space-saving perforated false bottom and a different configuration of gravel.

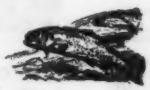
One Bams box is loaded with 112,163 eggs, the other with 53,650 eggs. The NMFS boxes contain 112,147 eggs and 56,074 eggs, respectively. Water flow to the high density boxes is 14.8 gallons per minute, while the low density boxes receive 7.4 gallons per minute.

Plans for the Auke Creek hatchery call for installation of 16 four by four by four foot incubators which will receive a total flow of 150 gallons per minute of filtered and sterilized water. This will enable the hatchery to produce up to one million fry per year for continued tests of the incubation system.

"If this system proves itself, it could be a valuable management tool for the production of fry for stocking Alaska's streams and rivers," says Roys.

"The system is simple, relatively inexpensive to construct and operate and can produce large numbers of high quality fry in limited space. We think it has a tremendous potential for a variety of projects," Roys said.

Although the initial tests at Auke Creek will be with pink salmon, the gravel box system could be used to build up runs of other salmon species elsewhere in the state.



So They Built A Better Trap--for Lobsters

The lobster fishery has experienced radical changes in the past decade, but one factor has remained constant: the fisherman's search for a trap that will "fish" better than any other. A trap fishes well when it attracts and holds as many lobsters as it possibly can. First, the lobster samples the bait in trap's kitchen. Then it moves leisurely into the "parlor," the trap's storage section. It is assumed in the fishery that the lobster cannot make its way out.

From its beginnings over 200 years ago, to the early 1960s, New England commercial lobstering remained unchanged. Generally, the lone lobsterman went to sea in his small boat. Each morning, in water close to shore, he set wooden pots in 6 to 120 feet of water; at night, he hauled them--hoping to see $\frac{1}{2}$ to $2\frac{1}{2}$ pounds in each trap.

Offshore Lobsters

The inshore supply of lobsters kept falling behind, and the lobsterman went farther looking for more. He found a large popula- 100 to 250 miles offshore, down to 2,000 feet. Lobstering became a new venture: large boats, 7-8-man crews, expensive equipment. The lobsterman tried trawling at first, but it did not work. Lobsters often were damaged, and the trawling gear was damaged on rough bottoms.

NMFS Research

NMFS undertook to produce a practical trap for the offshore fishery. First, its researchers tried steel. Most inshore lobstermen already had replaced their traps' wooden slats with polyvinyl-coated wire mesh because it resisted water less and therefore lasted longer. This concept was carried over to an all-metal polyvinyl or aluminum-coated trap. This was heavier and less buoyant in deep water, and much lighter and easier to handle out of water; it weighs about half the water-logged wooden pot.

Price was the problem. Big traps were designed first--up to 138 pounds costing $100 each. This was too much for the average offshore lobsterman fishing over 500 pots. Also, many lobstermen believed that metal did not fish as well as wood; to them, wood takes on an attractive mossy exterior and fishy smell.

As design was modified and price lowered considerably, all-metal traps won over some fishermen. The 48 x 28 x 18 inch size is popular. It costs about $24; a wood-framed trap, same size and design, costs around $18. When a lobsterman handles hundreds of pots, the $6 difference becomes great.

The Double-Parlor Model

The 48 x 28 x 18 inch size, called the double-parlor model, is the best-selling offshore trap of several New England manufacturers. It represents a major change from two other pots: the standard inshore trap, with one parlor, and the unsuccessful large-size pots developed for offshore fishing. The double-parlor trap, supporters say, has 2 advantages: it offers more holding space for lobsters (important when traps are hauled only every 4-5 days), and it offers the lobster two exits from the kitchen--and so eases the congestion around the bait there. Fishermen generally are pleased with this model.

Which Material for Ideal Trap?

No material is ideal for the lobster pot, according to the New England Marine Resources Information Program. Besides considering which material fishes best, the lobsterman has to consider price, weight, and durability. Neither wood, steel, nor plastic meets all requirements.

Shipworms

Many fishermen believe that wood-framed traps catch 25-30% more lobster than all-metal traps. However, wood is susceptible to attack by shipworms when not dried periodically, as are inshore traps. After 4 or 5 months, it is not uncommon for a fisherman to lose a third or more of his traps to shipworms.

Many fishermen doubt the value of dips that are applied to wooden traps and are supposed to keep shipworms--but not lobsters--away.

It is safe to say that fishermen will continue to debate the economics and longevity of wood vs. metal traps for many a lobster season.

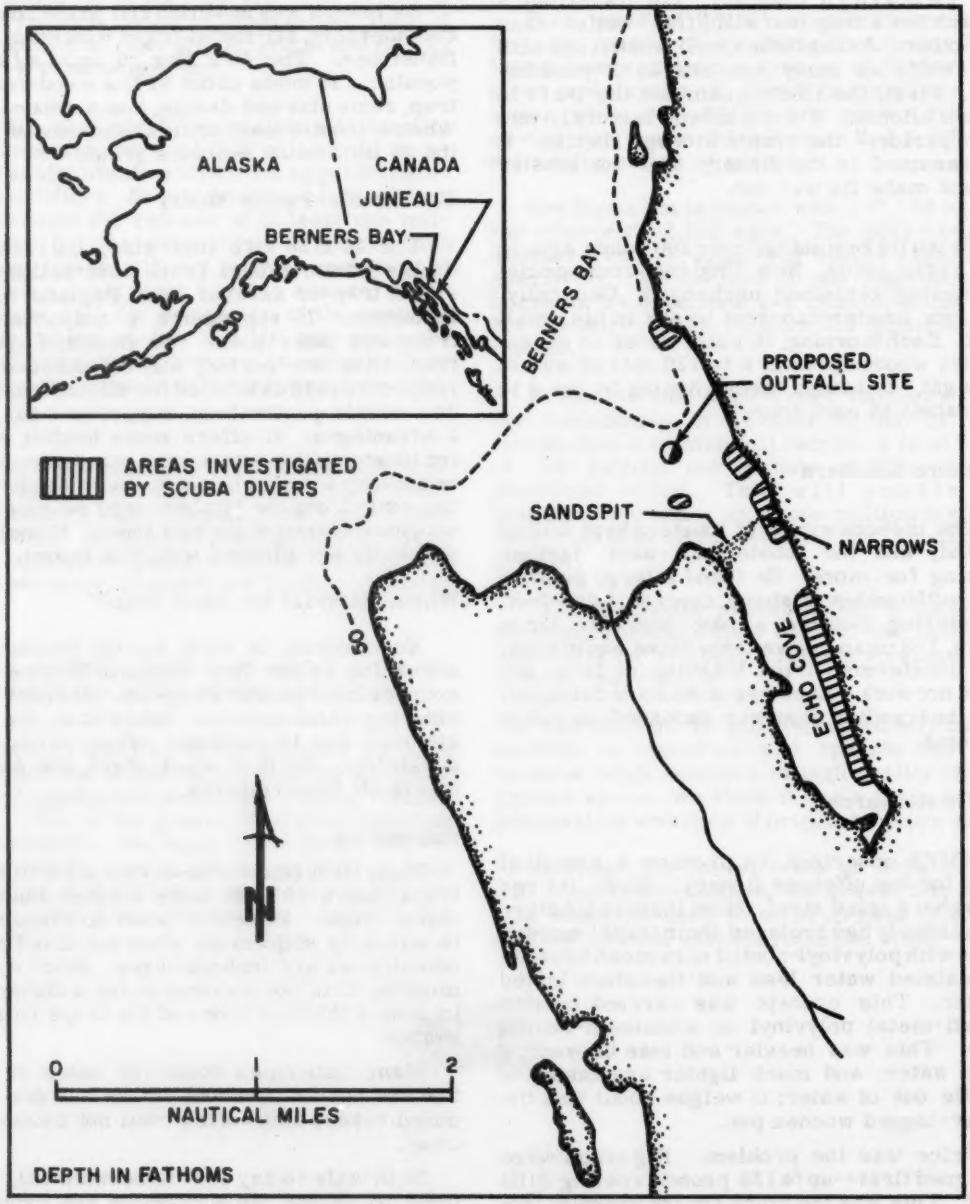


Fig. 1 - Location map of study.

MARINE LIFE ABUNDANT NEAR SITE OF PROPOSED ALASKAN MILL

Richard T. Myren

Numerous marine organisms--many of commercial importance--were observed by biologists of the National Marine Fisheries Service Auke Bay Fisheries Laboratory on a recent survey near Juneau at Echo Cove, the site of a proposed large pulp-and-lumber mill (Fig. 1). The biologists worked from the research vessel 'Murre II' and used three techniques to sample marine life: underwater time-lapse photography, observations by divers, and fishing with a bottom grab sampler. Scientists from the State of Alaska Department of Environmental Conservation also participated in the survey. They collected geological information on bottom sediments.

A series of photographs was taken over an 18-hour period with a stationary underwater camera-strobe system in 210 ft. of water at the site of the proposed location of the mill effluent outfall. The camera system was mounted on a quadrupod (described in Commercial Fisheries Review, Vol. 29, No. 1). The photographic target area was a sheet of plywood baited at the center with herring. Yellowfin sole; king, Dungeness, and tanner crabs; and pink shrimp were attracted to the bait. In addition to documenting the presence of these species, the serial photos, taken at half-hour intervals, disclosed differential behavior among the species attracted to the bait in the camera's view.

Yellowfin sole appeared first, shortly after the camera was in position at 1:30 p.m. (Fig. 2A). Dungeness crabs appeared between 3:30 and 4 p.m. (Fig. 2B). By 8 p.m., most of the sole had left the area (possibly displaced by the Dungeness crabs) and a few pink shrimp began to appear (Fig. 2C). Tanner crabs were abundant at 10 p.m. (Fig. 2D), and shrimp became more abundant during the night--from 10:30 p.m. until 7:30 a.m. (Fig. 2E), when the experiment was completed. King crabs such as the one photographed at 2:30 a.m. (Fig. 2F) appeared occasionally.

Behavioral Differences

The sequence of photographs demonstrated behavioral differences between species of larger mobile benthic animals. The shrimp may have been inhibited from approaching the bait while the sole were present because of the threat of predation by the fish--or because of effects of daylight and darkness on general activity. The sole were displaced by the crabs, but the shrimp were not inhibited by the presence of crabs. Perhaps the shrimp temporarily benefited from the presence of the crabs by receiving protection from the fish and, thereby, access to the food.

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COMMERCIAL FISHERIES REVIEW
Reprint No. 930

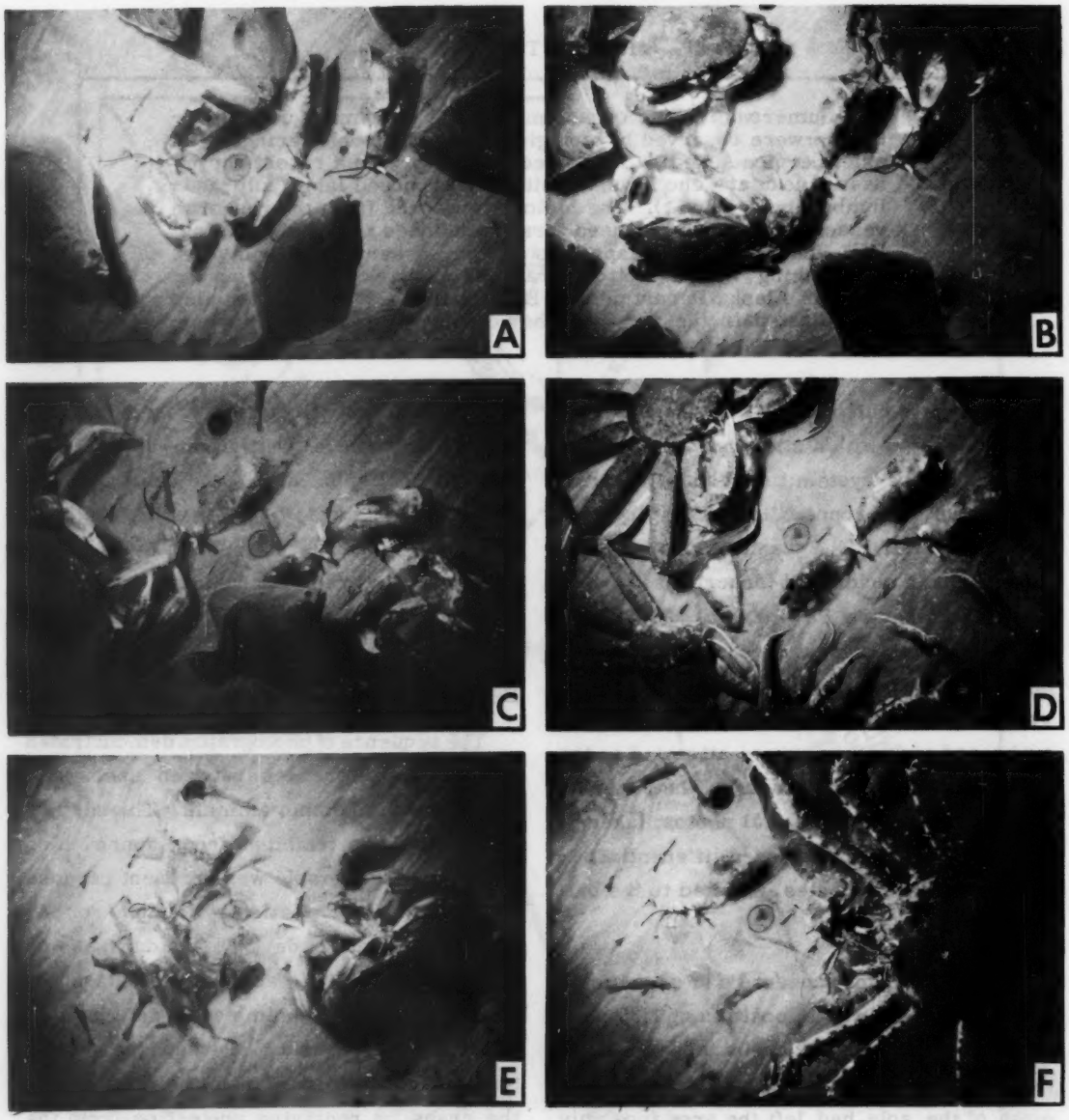


Fig. 2 - Selected photographs from series taken over an 18-hour period with a camera-strobe system.

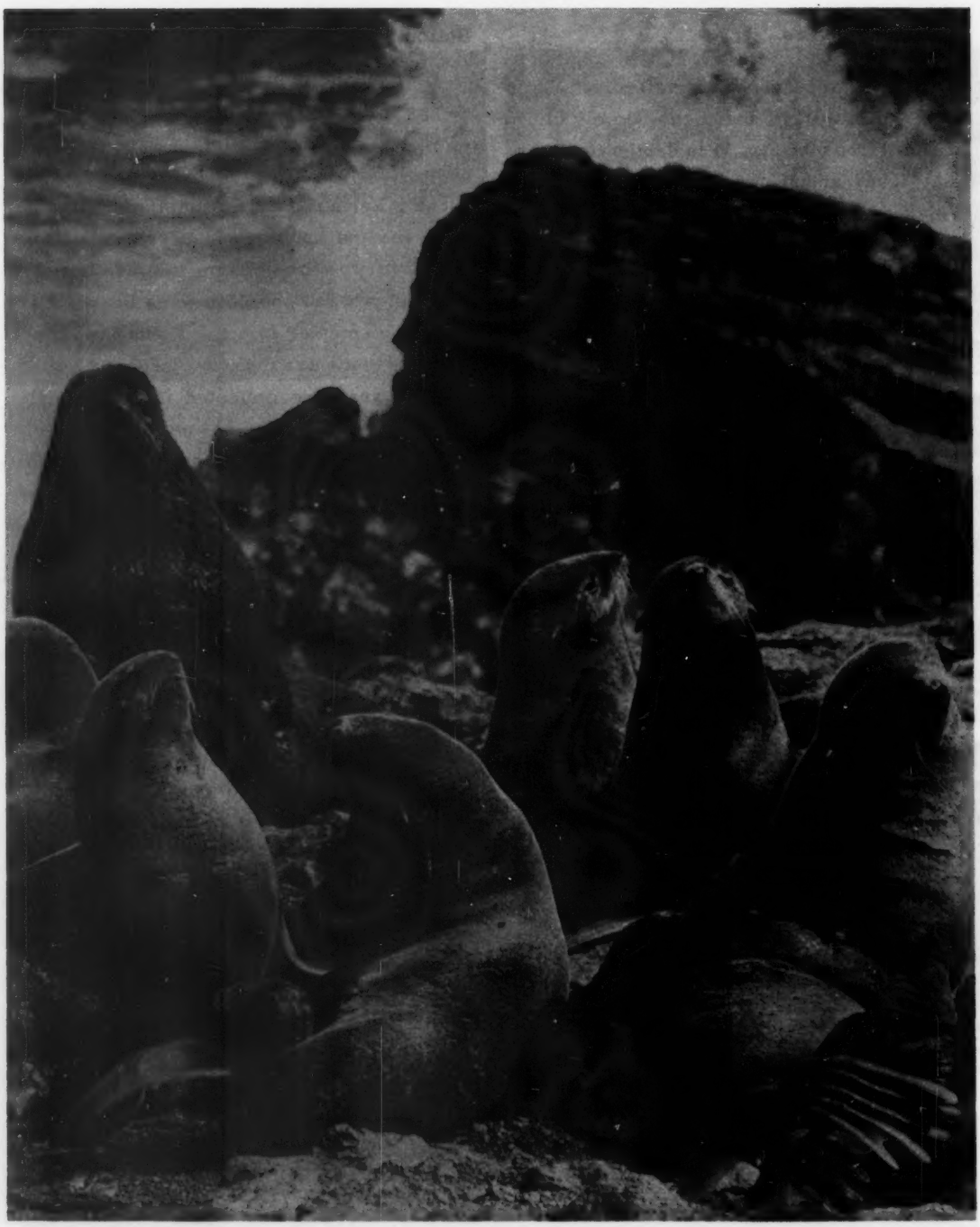
Biologists-Divers

A four-man team of biologists-divers also made 13 dives in the Echo Cove vicinity (shaded areas of Fig. 1) in depths to 100 ft. They found abundant populations of invertebrates. Molting and mating tanner crabs were common throughout the area. Several hundred maturing female king crabs were concentrated just outside Echo Cove--an indication that the area may serve as a mating area for this species later in the season as adult males migrate shoreward from deep water. Adult male Dungeness crabs were found just inside the narrows at the entrance to Echo Cove. Juvenile pink and humpy shrimps were very abundant in several areas. Sea urchins, anemones, clams, and many other invertebrates were especially abundant at the entrance to Echo Cove. The strong currents through the narrows probably contribute to the high biological productivity of this area.

Bottom Samples Collected

Bottom samples were collected by a grab sampler at several locations in 90 to 630 ft. of water. Burrowing animals were abundant, particularly in Echo Cove and the adjacent areas of Berners Bay. Surprising and significant was the capture of several adult sand lances in two of the bottom samples near the sandspit where Echo Cove joins Berner Bay. The grab sampler is not designed to capture fish and only a few square inches of bottom surface area are collected in each sample; therefore, the sand lances may be very abundant. A high abundance of these small forage fish would help explain why large numbers of salmon, trout, halibut, seals, sea lions, whales, eagles, gulls, and diving birds are often observed in the Echo Cove area.

Periodic surveys of the marine environment at Echo Cove will be continued to predict the environmental impact of the mill on the marine environment, especially the commercial species of fish and shellfish, and to provide baseline data for comparisons after the mill is built.



A fur seal family on St. Paul Island, Pribilof Group, Alaska. (Photo: V. B. Scheffer)

MEASURING MORTALITY OF FUR-SEAL PUPS IS IMPORTANT TO MANAGEMENT OF HERDS

About a million northern fur seals (Callorhinus ursinus) return to the Pribilof Islands in the Bering Sea each year. In rookeries on these five small islands, mostly on St. Paul and St. George, the pups are born and the adults breed. Forty to 50 thousand fur seals are harvested annually for their furs. By agreement, these are divided among Canada, Japan, and the U.S.

NMFS is responsible for management and conservation of these herds. Research seeks to determine the most favorable level at which to hold the breeding population in order to produce a maximum sustained yield.

Management is made more difficult by appreciable fluctuations in survival of pups from birth through their early years. So an important research aspect is to detect and measure these fluctuations and to analyze the importance of several survival or mortality factors. Then, independent and collective effects of these factors as related to deliberate population manipulations can be investigated to make possible more effective management of the herds.

Estimating Breeding Population

NMFS wildlife biologists have developed reasonably accurate methods of estimating adult females and males required to produce certain numbers of pups. With a pregnancy rate of 0.6, five adult females are needed to produce three pups. About 500,000 females produced the 300,000 pups (200,000 females were nonpregnant for various reasons) estimated to have been born in 1969-70. The fur seal is a polygamous breeder. So with one male to a harem of many females, about 7,000 "harem" bulls counted on the rookeries in 1969-70 sired the 300,000 pups born in those years.

Causes of Mortality

Pups die on land and in sea. Causes of death on land vary and may or may not be factors in deaths at sea. To meet the need for a continuous systematic approach to research on mortality of newborn seals, Dr. Mark C. Keyes, DVM, joined the Marine Mammal Division of the Northwest Fisheries Center in 1962.

As Research Veterinarian, he has concentrated on mortality factors, especially of newborn. Most deaths occur during first 4 weeks after birth, so field work on mortality is conducted primarily from about June 25 to August 15.

Dead pups are retrieved with a long gaff from catwalks constructed over three rookery study areas. The rookeries cannot be entered at ground level during height of breeding season because the ferocious $\frac{1}{4}$-ton bulls will attack a man without hesitation. The females and young males also are dangerous; even live pups must be handled carefully. Causes of death are determined by necropsies, postmortem detailed laboratory examination of pup bodies.

10 Summers of Mortality Research

During the last 10 summers, 1962-71, on St. Paul Island, Dr. Keyes and his assistants retrieved nearly 2,000 dead pups for examination. About 7% of the examinations yielded no diagnosis; 10% of the bodies could not be examined because of advanced postmortem degeneration. Causes of death are grouped into six major categories with most prevalent first: apparent malnutrition, hookworm disease, microbial infection, multiple hemorrhage--liver damage--perinatal complex, trauma, and miscellaneous. In 1971, hookworm disease and malnutrition together accounted for 73.5% of the deaths.

The causes of death are complex. Although the researchers have accumulated considerable data, they do not know the interactions of various factors. Apparent nutrition cannot be explained on the basis of simple starvation due to separation of mother and pup. The mother could have had agalactia, a condition that prevented her production of milk. Also, the pup could have been carrying several diseases leading to loss of appetite, and so emaciation occurred. Investigation of microbial infection would be facilitated if trained virologists were present to develop seal tissue culture cell lines. Where liver damage was the primary lesion, the organ was found to be extremely fragile; it often leaked blood into the body cavity. Trauma was caused by bites from other mothers (protective attitude) or from other seals on the crowded rookeries.

The Hookworm

The hookworm (Ucinaria lucasi) long has been known as a major cause of death of pups. In early investigations, infected pups of one-years class were believed to pass the eggs of this parasite into the rookery soil. There they hatched, wintered as larvae, and infected following year-class by penetrating flippers and migrating to intestines to cause anemia by feeding on their hosts' blood. At the same time, biologists were puzzled because hookworms were never found in seals older than pups. The study area was saturated with powerful chemicals to control or eliminate the source of infection by killing overwintering larvae in the soil. Control efforts failed: pups born a few weeks later had mortality equal to pups born on untreated areas.

Ten seasons (between 1951 and 1962) of contract research revealed the hookworm's unique life history. The work was done by Dr. O. Wilfred Olsen--parasitologist with Colorado State University--and his graduate student assistant, Dr. Eugene Lyons. As expected, the larvae were found to penetrate the flippers of seals of both sexes and all ages. Instead of moving to the intestines, however, the larvae migrated to the belly blubber. There they lay dormant in all seals except some females. Carried by the pregnant female, the larvae moved into mammary glands to infect her pup at its first, and only the first, nursing. This discovery emphasized the futility of early control methods of chemical saturation of the ground.

A diagnosis is made on the basis of lesions--alteration of normal structure or function of a part--that are characteristic of a particular cause. It is designated primary, secondary, tertiary, etc., according to relative severity of lesions or order of occurrence.

Mortality Rates

To get estimate of death rate, or percentage of year-class that died, the number of pups born must first be estimated. Several thousands pups are marked temporarily in early August by shearing a patch of fur from top of head. Later counts of several hundred samples of 25 pups each (after sheared and unsheared pups have throughly mixed) yield a marked-to-unmarked ratio from which an estimate of total number born is made. Estimates made with this method (or another method of marking pups with permanent tags) are tested by actual counts on small rookeries. By October, the pups have molted. Those sheared have lost their marks.

Survival of each year-class to ages 2-5 (or reciprocal-mortality rate) is measured by comparing number of pups born against (1) number of young males from year-class harvested and allowed to escape, and (2) an equal number of females from year-class--assuming 1 to 1 sex ratio of survivors. Counts of dead pups on land are made on rookeries each August. Although counts are made carefully, they are not completely accurate because some pups have been eaten by scavengers, others have been washed away by the sea, and some have decomposed.

The Seal as Experimental Animal

For disease and other research, a system of maintaining fur-seal pups in captivity was necessary. To incriminate one organism as causative agent of an infectious disease, it must be isolated from the subject; on exposure of a susceptible subject, it must produce the disease. Then the same organism must be isolated from the experimental subject. For such reasons, fur seals as experimental animals could answer many questions.

The first problems were development of artificial fur-seal milk and establishment of appropriate husbandry practices to rear newborn fur seals. After 3 years of trials, Dr. Keyes was successful. Since then, fur-seal pups have been used in cryogenic (very low temperatures) marking experiments, studies of echo-sounding capabilities of fur seals, and research on experimental transmission of seal diseases.

Nutrition Experiments

Nutrition experiments and knowledge obtained about pups' nutritional requirements led to research and analysis of feeding problems with captive marine mammals in general. Through these efforts, it became apparent that the difficulties in preserving nutritional value of fresh fish fed to seals and porpoises could be solved with a processed food. Such a product was developed at the NMFS Pacific Fishery Products Technology Center, Seattle, by Max Patashnik, Paul Kangas, and Dr. Keyes. It is made mainly

from whole fish and kelp. The food is compact, pasteurized, and stable in storage. It is produced and marketed by a private company under the name "Sea Ration".

Anesthesia and Restraint

While obtaining milk samples from seals so artificial milk could be formulated, Dr. Keyes developed methods of anesthesia and restraint that could be used to implant instruments in fur seals to study their cardiovascular adjustments during diving and various methods of slaughter. During these experiments, conducted by Virginia Mason Research Center, Seattle, an instrument was developed by Dr. M. P. Spencer of VMRC. It detects bubbles in the blood stream of human divers before any signs of decompression sickness were apparent to the divers themselves.

During necropsies of pups in 1962, Dr. Keyes observed the large size of the pineal gland (a brain appendage) of a pup that displayed convulsions before death. It necessitated examination of the central nervous system. This discovery has led to cooperative work on the endocrinology of the pineal gland of fur seals with the Massachusetts Institute of Technology. It has established the fur seal as a model for studying the probable function of the mammalian pineal gland.

Objectives of Future Research

Research on mortality will continue along the lines of animal physiology. The entire process of how disease begins, develops, and causes death or disability of the seal will be investigated. The researchers will emphasize that part of the process that takes place at sea. It will include rearing seals from birth and subjecting them to environmental features similar to those in the ocean.

Massed seals on St. Paul Island. (Photo: V. B. Scheffer)

OREGON FISHERMEN PROFILED

The men behind the gear in the nearly $70 million Oregon fishing industry are caught in a study by Oregon State University (OSU) as part of the NOAA Sea Grant Program.

Who are they? Frederick J. Smith, Extension Specialist in Marine Economics, writes: "The typical Oregon fisherman is clearly not the old, weatherbeaten, long-time waterfront dweller that many imagine him to be. If the typical fisherman of 1968 and 1969 could be assembled from the nearly 6,000 fishermen he represents, he would be 41 years old, live about 45 miles from the coast, have a 51% ownership in a vessel for less than three years, earn 66% of his income from fishing and would have fished for less than six years."

Mr. Smith emphasizes the importance of knowing these men: "An appreciation of these characteristics will contribute to more relevant, effective and efficient research and educational efforts directed towards Oregon's fishing industry."

Data Sources

The researchers used data from the files of the Fish Commission of Oregon and from surveys conducted in 1970 by OSU Marine Advisory Program.

The Commission issues commercial fishing licenses to persons who catch or help to catch food fish for commercial purposes in Oregon waters; to those who land food fish for commercial purposes; and to persons who operate (or assist) commercial fishing vessel or gear. Also, the Commission licenses every commercial fishing vessel. Name, age, mailing address, and numbers are on these licenses.

Number of Fishermen

In 1968, the Commission issued 5,923 commercial licenses; in 1969, 5,663. During 1968 and 1969, 8,085 different persons held Oregon commercial fishing licenses. Up to 53% of these license holders are crew, not captains. Nearly all licensees are fishermen because there are very few vessels with crew members who do not handle fish or gear.

Average Age Is 41

Licensed fishermen are relatively young. Nearly 12% were college age (17 to 21). There were more 20-year-olds than any other single age; many in 30 to 36 group; more than half in 42 to 50 range. The average age was 41, "and there is no reason to believe that this is rising." Nearly 45% of all licensees were under 41, and nearly 65% under 50.

21% Non-Resident

All licensees do not live on Oregon coast or in state. Over 21% were non-residents. Resident license holders lived an average 45 miles from Pacific. Nearly as many commercial fishermen lived inland as in major ports. The majority of non-residents lived in California or Washington.

Many fishermen lived inland during most of year and on coast during fishing season.

Do They Own Vessels?

More than half the licensees obtained a vessel license; over 95% of licensed vessels were licensed by persons who also held fishing licenses. Absentee vessel ownership is minor. About 3% of vessel license holders licensed more than one vessel in 1968 and 1969. The person who licensed the vessel may have been running it under lease or share arrangement. The true owner's name, often the mortgager's, may never have appeared in records.

The number of owners-operators probably was a little under 90% of 3,000 vessel licenses issued--but over 50% of all commercially licensed fishermen. "This is a significantly large percentage compared to other states," writes Mr. Smith.

Vessel Owners Average 45

Of all 44-year-old fishing licensees, 75% also held vessel licenses. Of all 26- or 67-year-old fishing license holders, only 25% also held vessel licenses.

During 1968 and 1969, the average age of all vessel licensees was 45. This was a little above the average age of 41 for all fishing licensees. Of all vessels, 52% were licensed by persons 45 or younger; 66% of vessels by those 50 or younger. Vessels were licensed by 16-, 17-, and 18-year-olds as well as 71-, 72-, and 73-year-olds.

Where Owners Live

Of all vessel licensees, 1,000 lived on the coast and over 700 in the Willamette Valley. The average distance was 34 miles, although some lived up to 200 miles from Pacific. Resident fishing licensees lived an average 45 miles from coast. "In general, the geographic distribution of vessel license holders is surprisingly close to that of all commercial fishing licenses."

The Part-Timers

A commercial fisherman is a part-timer if he holds a second job while fishing or fishes one year and lays off the next. In 1970, nearly 38% of Oregon licensed fishermen received less than half their annual income from fishing; 46% received all from fishing.

Nearly 43% of licensees had fished 5 or fewer years. The fishing industry sees many persons enter one year and drop out the next.

In 1968, of 5,923 persons who obtained licenses, only 3,501 renewed their licenses. They were joined by 2,162 new licensees in 1969. The turnover for 1968 and 1969 was over 25%.

Vessel license holders change vessels at a faster rate. In 1968, of 3,048 licenses issued, 68% renewed with same vessel or vessels; 32% either changed vessels, did not renew, or were new licensees.

"In general," states Mr. Smith, "there are many part-time fishermen in Oregon and even the full-time fishermen change vessels frequently."

HADDOCK SPAWN IN CAPTIVITY

For the first time in the U.S., haddock are spawning in captivity--at the Narragansett (R.I.) Laboratory of the NMFS Northeast Fisheries Center.

Haddock, "scrod" on the restaurant menu, is a traditional and valued foodfish. Once king of the New England groundfish industry, the haddock has been reduced by heavy fishing and poor spawning success in recent years.

Haddock spawn during March or April in the bottom waters off New England. The first time haddock spawned in an aquarium was in 1967; it was an accident. The water-cooling unit in a marine laboratory in Aberdeen, Scotland, broke down and the water temperature in a tank began to rise. A night watchman was the first person in marine research to observe the courtship and spawning act of haddock.

The Narragansett Project

The Narragansett Laboratory obtained 12 sexually mature haddock from Bob Nickerson, a Chatham, Mass., longline fisherman. The fish were placed in experimental tanks on February 17, 1972, and held at a temperature of 40 degrees (fahrenheit) for two weeks. After that, the temperature was increased slowly a fraction of a degree each day.

Dr. Geoffrey C. Laurence, who directed the experiment, reported: "As the temperature increased, the females enlarged noticeably. On the afternoon of March 3, there were no eggs in the water. When we came to work the next morning, there were eggs in the water; so we knew the fish had spawned." Spawning had begun only two days after the increase in temperature began and continued nightly from March 7 to March 17.

Fig. 1 - These haddock, photographed during day, spawned several nights in succession. It was first time in U.S. that haddock spawned in captivity.

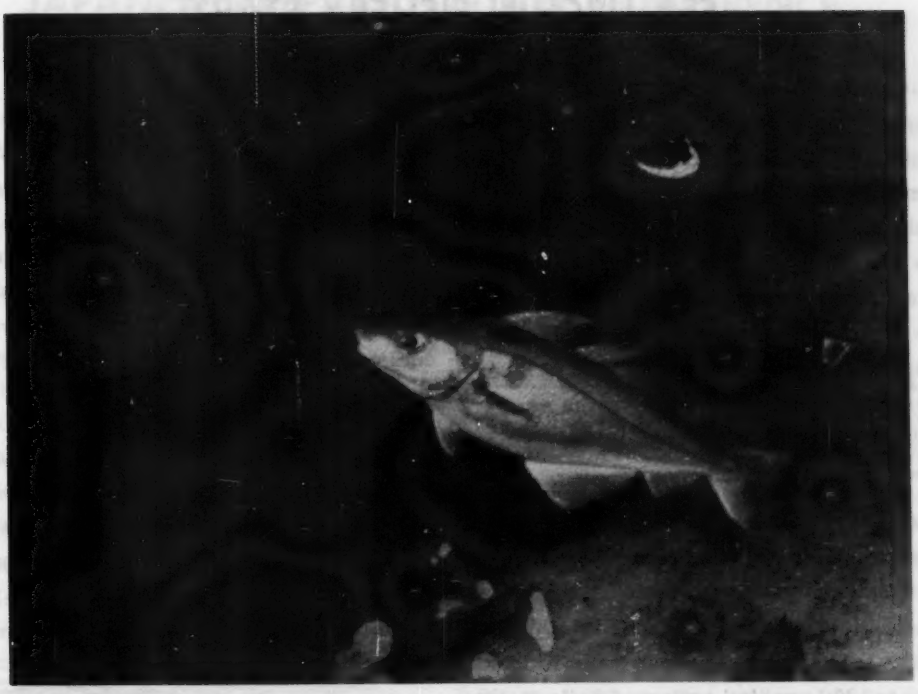


Fig. 2 - Haddock approaches microphone used by scientists to record "clicking" sound made by male during the spawning season. (R. K. Brigham)

At first, only 10% of the eggs were found to be fertilized. When the temperature reached 42 degrees, fertilization improved to 90%.

The amount of eggs also increased. On March 16, observers watched Dr. Laurence draw a fine mesh net twice around the circumference of the 15,000-gallon tank. The operation brought in over a quart of eggs.

Hydrophones and amplifiers were placed in the tank so scientists could listen to the "clicking" sound made by the male haddock during the time of spawning. This sound is produced by special muscles highly developed in sexually mature fish. During courtship activities preceding the spawning act, the sounds intensify. The repetition frequency increases to give a "humming" sound.

Significance of Successful Spawning

The successful spawning of haddock at the Narragansett Laboratory means it will be possible to supply experimental biologists at the Northeast Fisheries Center with large numbers of fertilized haddock eggs of known age. These eggs will be used to study the fish's early life stages.

A single haddock female can produce up to one million eggs. But when the fertilized eggs rise and float near the ocean surface, mortality is high. It is very difficult to detect the actual causes of larval mortality and even to measure this mortality rate in the open ocean.

Research Vessel Surveys

The NMFS research vessel 'Albatross IV' samples throughout the spawning season to learn the distribution and abundance of haddock eggs and larvae on Georges Bank. Biologists at Northeast Fisheries Center headquarters in Woods Hole, Mass., are confident that sufficient sampling at sea will yield valuable clues to factors in the environment that are most important to the survival of eggs and larvae. Then these clues can be used to set up tests under experimental conditions that should reveal even more about cause and effect in larval mortality.

To assess and manage this valuable resource, NMFS scientists say, it is essential to understand the growth process that culminates in the entry of the fish into the "fishable" population.

SEA URCHIN FISHERY STARTS

Sus Kato of the NMFS Tiburon Fisheries Laboratory traveled to Avila Beach to help initiate the sea-urchin fishery. The first shipment of sea-urchin gonads, destined for the domestic market, was delivered from Avila Beach to Los Angeles on February 24. These gonads are considered a delicacy in some gourmet establishments, especially Japanese seafood restaurants. The fishery was expected to start several months earlier, but the absence of suitable packing material forced the long postponement.

Mr. Kato provided on-site indoctrination and instructions to the divers, "shuckers", cleaners, and packers. As a result of his visit, the yield rose from 25 pounds of gonads per day to 100 pounds. This yield is based on 800 to 1200 urchins collected daily by two divers in about four hours. Up to 11 other part-time workers have been employed in a single day's operation.

The immediate goal is to produce 200 pounds of gonads daily for U.S. consumption with about 15 full-time workers. Initial reaction of the wholesale and retail buyers was mixed. A meeting was held to discuss product quality. The problems appear minor. The fishery promises to be viable. It will aid in the economy of the little port town of Avila Beach.

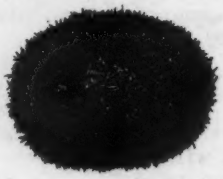
The San Diego Fishery

Several months ago, NMFS helped start a sea-urchin fishery in San Diego, Calif. On February 23, two tons of whole red urchins and 150 pounds of processed urchins were delivered frozen to Los Angeles for shipment to Yokohama and Kobe, Japan. Delivery was delayed because of the extended dock workers' strike.

The San Diego fishery is small, although up to six people have been employed by the processor. The potential for becoming a large export trade with Japan is uncertain. This is due primarily to the extremely large size of the gonads and because frozen urchin gonads are new to Japan.

Fishery Helps Environment

Besides economic benefits, many persons believe that the removal of sea urchins will lead to a better environment for fish and shellfish. For example, sea urchins are reported to compete directly with abalone for space and probably for food as well. Also, experiments have indicated that removal of urchins enhances the growth of kelp beds which, in turn, provides suitable habitats for many species of fish.

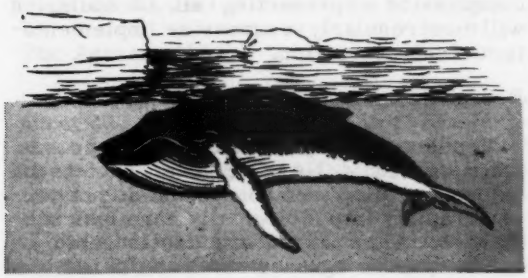


Sea urchin

JAPANESE PREPARE FOR U.N. CONFERENCE ON WHALES

How to conserve whale species will be considered at the UN Conference on the Human Environment at Stockholm, Sweden, in June 1972. According to the Japanese press, Japan and the USSR will bear the brunt of attacks by other nations.

The Japanese believe that materials being prepared for the conference will show a sharp decline in blue whales over the past 40 years, and that the humpback whale is seriously threatened. They expect a decline in marine mammals to be attributed to Japan and USSR.



A Different View

Tatsuzo Oyama, the Japan Fishery Agency, states that most of the arguments are "groundless" and "emotional" rather than scientific. He believes there are about 17,000 blue whales in the Antarctic, and another 1,400 in the North Pacific. "These figures show that the species do not face extinction."

Kinji Fukuda, a whaling company official, notes that foreign fleets used to hunt whales for their oil and meat to be used as dog and cat food. However, in Japan, it is an important source of human food--about 10% of all meat consumed, or roughly half the beef consumed.

Whaling Restrictions

Dr. Hideo Omura, director of Tokyo's Whale Research Institute, states that whaling for humpback and blue whales was completely forbidden in 1963 and 1964. At present, only fin, sei, and sperm whales can be caught within quotas established by the International Whaling Commission. More than 70,000 catchable whales, excluding calves, are believed to exist in the Antarctic. Taking 3,000 to 4,000 a year will not deplete resources, Omura believes. Japan and the USSR are allowed 2,300 blue whale units (1 blue whale unit equals 1 blue, 2 fin, or 2.5 humpback whales.) An international agreement between Japan and the USSR on observers for the whaling fleets would help protect stocks.

Observers Stranded

Dr. Seiji Kaya, who set up a "Society to Protect Whales," notes that the Soviet fleet sailed before observers could board the vessels. This was a major setback. He would like to see the blue-whale-unit system abolished and a catch limit for each species substituted. ('Japan Times', March 6.)

12 EUROPEAN COUNTRIES SIGN ANTIPOLLUTION PACT

Twelve European countries signed a convention, in Oslo, Norway, on February 15 designed to stop the dumping of poisonous waste by ships and planes in the northeast Atlantic.

The convention prohibits totally the dumping of durable plastics and dangerous substances, such as mercury and cadmium, that find their way into the food chain. Less harmful substances and materials--arsenic, lead, pesticides, scrap metal, and tar--can be discharged only with special permits.

British Government officials, who began negotiations in London in June 1971 that led to the convention, described it as "the biggest single step yet taken to fight sea pollution."

The Signers

In addition to Britain and Norway, the signers were Belgium, France, Denmark, West Germany, Finland, Iceland, The Netherlands, Portugal, Spain, and Sweden. The Soviet Union and Poland were invited to join the convention but said no.

British officials stressed that the agreement was a large accomplishment--but that ships and planes caused only a small part of marine pollution.

Industrial and Domestic Discharges

Ninety percent of this pollution is caused by industrial and domestic discharges through rivers, estuaries, outfalls, and pipelines that are under national jurisdiction. No international action has been taken on this problem.

However, the convention preamble expresses the hope that the 12 signers will coordinate policies to control pollution of their own waterways.

Preventive Steps Asked

Article 1 of the 27-article convention calls upon the countries to "pledge themselves to take all possible steps to prevent the pollution of the sea by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea."

The Convention area covers the high seas and territorial waters in the northeast Atlantic, including the North Sea and part of the Arctic Ocean. The area extends westward to Greenland, and southward to the Strait of Gibraltar. It excludes the Baltic Sea.

Parliamentary Approval Needed

The convention "for the prevention of marine pollution by dumping from ships and aircraft" becomes effective when ratified by the Parliaments of seven of the 12 countries. A commission representing all 12 countries will meet regularly to supervise implementation of the convention.

Banned Substances Listed

Besides mercury and cadmium compounds, other banned substances are poisonous halogen or silcon compounds that do not convert rapidly into biologically harmless substances. Also banned are carcinogenic, or cancer-producing, substances and "persistent synthetic materials" that float.

Specific Permits

Among the other substances that can be dumped with specific permits from national authorities are copper, zinc, cyanides, fluorides, and containers.

The convention states that when it is considered necessary to deposit waste in deep water, it should be done only when two conditions are fulfilled: (1) The depth is not less than 2,000 meters (about 6,500 feet); (2) The distance from the nearest land is not less than 150 nautical miles.

British officials said penalties for violation of the convention would be legislated initially by the parliaments of the member nations. But there will be an attempt to coordinate them after the convention becomes effective.

U.S. & DENMARK AGREE ON CURTAILING ATLANTIC SALMON FISHERY

The U.S. and Denmark have agreed on curtailing the salmon fishery off West Greenland, the U.S. Department of State reported Feb. 22, 1972. U.S. and Danish officials met in Washington, Feb. 3-5.

The high-seas fishery conducted off Greenland by Danish flag vessels will be phased out gradually over a 4-year period, 1972 through 1975. The inshore salmon catch by local Greenland fishermen will be stabilized.

The agreement is equitable to all parties, the U.S. believes: to the countries where the Atlantic salmon originates, such as the U.S., which spend much money to protect salmon in the streams of origin; and to Denmark in the local Greenland fishery, which has special importance to Greenland's economy.

The Agreement

Denmark will limit its high-seas catch to about 800 tons (round weight) in 1972. In the three following years, it will reduce the catch to about 600, 550, and 500 tons. After that, Denmark will end the fishery.

Salmon fishing by local Greenlanders within the 12-mile fishing zone will be limited to about 1,000 tons a year.

Denmark and the U.S. will seek to have the essentials of their agreement incorporated into the conservation regulations of the International Commission for the Northwest Atlantic Fisheries (ICNAF) at its annual meeting in May. They have been consulting other governments directly concerned--Canada, the United Kingdom, and Norway. Already, ICNAF has banned high-seas salmon fishing effective for 12 member nations.

Status of Salmon Stocks

Denmark or the U.S. can request a meeting to review the status of salmon stocks. In a joint statement on Atlantic salmon, Dec. 24, 1971, the U.S. and Canada pledged to cooperate closely on conserving Atlantic salmon. The U.S. also will seek to ensure that other conservation measures are undertaken within North American inshore waters.

BRITAIN TO REFER DISPUTE WITH ICELAND TO WORLD COURT

Britain has decide to take to the International Court of Justice in The Hague her dispute with Iceland over fishery limits. Iceland plans to extend her limits from the present 12 nautical miles to 50 on September 1. The British move was announced on March 6 in the House of Commons by Anthony Royle, Parliamentary Under Secretary at the Foreign Office.

Dispute is over Iceland's plan to extend its fishing limits from 12 to 50 nautical miles.

A week earlier, the House of Lords was informed that Iceland's proposed extension would deprive Britain of 20 to 25% of haddock, cod, and plaice.

Hope For Interim Arrangement

British officials have informed Iceland about the Hague move. They hope to reach agreement with Iceland on interim arrangements for British fishing in the waters affected while the case is before the World Court.

'Cod War'

There was a long "cod war" between Iceland and Britain in which clashes at sea occurred. In 1961, the 2 parties reached agreement. Iceland's fishing limits were set at 12 nautical miles. Britain maintains these limits cannot be ended by Iceland alone.

ICELANDERS EAT THE MOST FISH

Iceland leads all countries in annual per-capita consumption of edible fishery products: 86.1 pounds. Japan is second with 67.6. U.S. per-capita consumption in 1971 is estimated at 11.2 pounds.

NORWAY BUILDS FLOATING FISH MEAL & OIL FACTORY

A floating fish meal and oil factory, the 'Protangue', "the first plant in the world specially designed as a movable unit," is ready for delivery. It was built by Stord Bartz Industri A/S, Bergen, Norway, for the Portuguese firm Proteinas de Angola, Luanda.

The Protangue can process about 500 tons of raw material in 24 hours. This corresponds to about 100 tons of fish meal and 50-100 tons of oil--depending on type of fish.

The factory barge is 64.6 meters long overall, its breadth 17 meters, and dead weight 3500 tons.

The top deck is continuous from fore to aft. There is ample space for net repair and a helicopter deck.

The Protangue

It is constructed as a compact factory ship, without its own propulsion engine. When in operation, it will lie at anchor in port or alongside quay and operate as a self-supporting shore factory. It also can be towed to other ports or areas.

The manufacturer states: "The floating factory is fully equipped with processing plant for meal and oil; unloading, loading, conveying facilities; diesel electric power station, main steam power plant, fresh water generators, and storage tanks for raw material, fish meal, fish oil, fuel oil, diesel oil, and fresh water." There are air-conditioned cabins and lounges, gallery, and complete service for 20 men in production staff and management; office, and production control laboratory.

The purposes of this floating factory are: to be able to move to another area if fish supplies fail, if industry in the area becomes oversized; or quotas reduce raw material quantities available; or other circumstances make removal desirable.

Plant's Special Advantage

A special advantage of a "mobile factory plant" is that local conditions may not offer favorable conditions to build industrial plants in areas where fish supplies are abundant.

This applies to the underdeveloped countries. Where new fish stocks are to be exploited, the application of mobile factories of this type will mean an excellent solution: they can be put into service quickly and moved easily.

This type of factory is considerably less expensive to build and operate than the big factory ships of orthodox type for pelagic operation.

Raw Material Handling

The fish are unloaded from fishing boats by 12" Karmoy-type submersible pumps at a rate of 1500 tons fish per hour. The pumping water is removed in a stationary screen and wire-belt conveyor that brings the fish to an automatic measuring device. The fish are distributed by screw conveyors to 4 storage tanks, each with 120-ton holding capacity. The tanks are made for automatic discharge and built specially for easy cleaning. Bloodwater is strained off thoroughly during transport of fish from holding tanks to factory. The bloodwater is treated separately and used in the fish meal and oil process.

Process and Plant

The plant is a single Atlas-Stord process line for 100% utilization of the raw material. The raw material is supplied from an automatic feeder to a continuous indirect cooker type SS-75/12 with special device for level control and automatic heat control. The cooked material is treated in a special pre-dewatering arrangement--a combination of strainer conveyor and vibrating dewaterer type SVS-30. After pre-dewatering, the material is passed over a stationary magnet and then supplied to a twin-screw, press-type BS-56 F, in which oil and water are separated.

The "dry phase", the presscake, is distributed by screw conveyors to two Rotadisc Driers type TST 80 R operated in parallel.

After grinding in a horizontal Hammer Mill type M-44, the fish meal is treated automatically with antioxydant. It is passed through an automatic scale and finally pressed into pellets in a CPM pellet plant. The pellets are distributed to the meal stores under deck by conveyors. This ensures good use of the holds and good trimming conditions.

"The meal holds have a network of thermoelements for remote control of storage temperatures. Transshipment of pellets from factoryship to carrier is made by two pneumatic conveying systems with a capacity of 60 tons per hour."

The liquid phase from prestrainers and press is pumped via preheating tanks to a horizontal centrifuge-type Sharpless P-3400. The dry phase is mixed with the presscake; the liquid, consisting of oil and water, is treated in two automatic separators type Titan CNS 150. The separated fish oil is pumped to storage tanks. The remaining water, the stickwater, is processed to fish solubles in a stickwater-evaporating plant, type SAC 15 HLV, with stainless-steel tubes and automatic control.

The oil contents of the fish solubles are reduced to a minimum through separation in a solubles separator type Titan CNS 70. The soluble are mixed with the presscake and dried into whole meal.

Automatic controls are widely used. The complete plant can be operated at full production by 2-3 men.

ARSENAL OF OCEAN FISHERIES

Sergei Snegov

The Central Institute for Fishery Information and Technico-Economic Research (CIFITER) is only three years old. But within this short time, scientists at CIFITER gave the commercial fisheries numerous valuable recommendations--and set for designers problems the solution of which is bound to result in higher fish catch.

This article deals with the work of the commercial fishery laboratory headed by Ksenofont Pavlov, M.Sc. (Tech.).

What Kind of "Disposition" Does A Fish Have?

A fisherman will not find this question strange at all. He will probably suggest too that the quotation marks be crossed out. The point is that without knowing the fishes' disposition and behavior--differing not only in winter and summer, but even by day and at night--one cannot hope for a good catch. But, the system of "off-chance" and the concept of "fisherman's luck" are hopelessly outdated. Today, the successes of commercial fisheries must become constant and lend themselves to forecasting and exact calculation.

There is not room enough for all the vessels in traditional catch areas in shallow waters. Hundreds of trawlers and seiners sometimes crowd on small parts of the water area. Moreover, the stocks of valuable fish species in shelf waters require natural replenishment. So, the fishing flotillas sail ever farther and farther off the coast. Their catch of fishes and pelagic animals inhabiting the depths of the World Ocean is steadily growing. In our diet we now have mackerel and scad, capelin and tuna, anchovies and sardinelles, calmars and shrimps, as well as shark's "meat".

It is useless to try to catch the ocean's quick and timid inhabitants by old methods and tackle. New models of fishing equipment are being developed at institutes and designing bureaus with due account of the life and behavior of fish. But before speaking about them, we must answer the question: Where should pelagic fish be looked for? Does it have any favorite depths and location under the ocean surface that adds up to a hundred million square kilometers? (Scientists consider the areas where pelagic catch objects are to be found so immense.) Yes, it does. And they may be located through the simple taste of the oceanic population. Four fifths of all sea fishes and animals feed on plankton. And the development of phyto- and zoo-plankton proceeds in waters that are rich in nutrients: phosphorus, nitrogen, and potassium, in approximately a 45-meter layer which the sun rays necessary for photosynthesis penetrate. Plankton "clouds" stretch to approximately two kilometers down, and scientists consider that

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below that the ocean depths are almost uninhabited. Moreover, there are "dead" zones on the surface too. They account for 69% of the total area. These zones are reigned by circular currents, the water evaporates intensively, and its salinity increases. Heavy salt water ousts, as it were, the nutrients from the central areas of the World Ocean. There is nothing for a fisherman to do in these sea "deserts."

THE SACK THAT HAS BEEN TURNED INTO A STRUCTURE

The trawl, which used to be hauled over the bottom by a small vessel that used all the 600-650 h.p. of her steam engine, cannot qualify as anything but a sack. Fifteen or 20 years ago, such a sack, about 50 meters long and opened vertically but to a meter or two, was the main fishing tackle. It was attached to the trawler by two cables--wires. Its inlet--the mouth--was opened in the vertical plane by floats and sinkers, and in the horizontal by spacers on wires, flung open at a certain angle towards the direction of movement. Sluggish cods and haddocks and, less frequently, bass and flounder were the usual catch in those days.

It was considered that the catch could be increased by enlarging the trawl. And this meant greater resistance to be overcome by the tackle during travel, when water seeps through the small meshes of the net. Only a vessel with a powerful engine (several thousand h.p.) was capable of pulling it--and at a speed that would prevent the fishes from "escaping" from the trawl. There was another reason for the renovation of the trawling fleet: fisheries were becoming the expedition type. Vessels started sailing thousands of miles to fishing grounds and were away from home long months. A large-tonnage trawler, possessing a high degree of autonomy, was provided with a freezing plant. And then, too, an actual fish-processing shop appeared on such vessels.

The changeover to pelagic fishing, which began several years ago, proved much less simple than it might seem to the layman. At first sight, there is nothing difficult here: just pick the trawl off the ground, pull it closer to the vessel, and the pelagic fish will get into the net. Moreover, commercial fishermen have echo-sounders and fish locators. The trawl master has to only to look at the screen of the hydroacoustic receiver and to aim the mouth of the trawl at the shoal. At first, trawling often used to end in failure. The main reason was established when the trawl operation was observed directly under water. Skin-divers and then researchers of the Kaliningrad Special Experimental Designing Bureau (SEDB) for commercial fishery saw the complex behavior of various fish species near fishing tackle. The scientists went down in the "Atlanti-1" aquaplane. The fishes showed no "intention" of breaking through the netted walls of the trawl. They stayed three or four meters away from them. This meant that there was no need for small meshes. The very first tests of large-mesh trawls showed their advantages. The reduction of the hydrodynamic resistance of the net helped to enlarge considerably the dimensions of pelagic fishing tackle. The nets now used are so great that their "mouth"--the inlet--is capable of swallowing a multistoried building. Smaller resistance resulted in

much greater trawling speeds. Commercial fishing vessels pull whole shoals of quick mackerel and scad on board.

The mesh pitch already exceeds a meter for some experimental trawls. What is the optimum mesh size? How does the complex 3-dimensional structure, which ought to be called a "submarine plant," behave at various travel speeds? How is such a 100-meter-long "sack" to be controlled and aimed precisely at fish shoals? These are a few of the numerous questions to be answered. A large testing pool is being constructed in Kaliningrad. It will contain a thousand tons of water circulating at the velocity of 3-4 meters per second. It will help to experiment with models of trawls, propulsion screws, and turbines. The test pool will save much money now spent on marine testing the hydrodynamic characteristics of new trawling systems.

ELECTRIFIED TRAWL

Specialists from Poland, the German Democratic Republic (GDR), and the Soviet Union have tested it in the North Sea. The catch capacity of a trawl with netted electrodes attached to it is increased by two-thirds. The principle underlying the operation of this tackle is rather simple. The fish that gets into the zone of the electrodes effects is periodically hit by current and deprived of the possibility of escaping from the trawl forward.

The pulse electric device made in the GDR may operate in six different cycles. The most suitable is chosen for the definite fish species. Work with the electric trawl is quite safe. An automatic device limits the tensioning of the high-voltage cable, protecting it against overloads. The pulse generator is switched on only after 200 meters of cable are overboard. When the last 100 meters run out, a warning signal sounds.

An experimental specimen of an electric trawl for shrimp catch has been developed and constructed at the Kaliningrad SEDB. It produces a 40-50% higher effect than conventional shrimp trawls. Electric current is doing a fine job in the fishermen's trade.

THERE IS A NET, BUT NO VESSEL

Or, to be exact, there is no seiner that can cope with the most efficient pelagic catch tackle--the purse net.

What is a purse net like today and how is it used? It is a net of high-strength synthetic material, 1,000-1,200 meters long and 200-280 meters high. It is cast to trap a shoal located by search instrument or from a helicopter. After the ends of the net are drawn together (the gate is shut, as fishermen say), the cable running through rings on the lower edge of the net is tightened. The net turns into a giant purse stuffed with fish.

The very principle of purse-net catch demands that both seiner and her equipment possess special properties. The main ones are high speed and maneuverability of the

vessel and efficient operation of the net-drawing machine. Specimens of high speed and reliable deck mechanisms have already been tested and are being prepared for serial output. Now it is time to develop a seiner equipped with steering devices and active rudders meeting all requirements.

Meanwhile, fishermen have to resort to all possible devices to prevent the fish from escaping from nets.

FISHING "COMBINE" PUT OUT TO SEA

She carries various fishing tackle on board. A modernized bed trawl does good service in shallow waters. Its spacers are adjusted to raise directional mud clouds, leaving for the fish a single clean passage--into the trawl. The pelagic giant controlled from a desk in the steering room will report on all movements via an ultrasonic "channel" or via cable. The trawl may even become autonomous: it will be provided with its own submarine tugs.

Before the ocean "combine" starts a purse-net catch, an automatic steering system based on electronic computers will be switched on. Analyzing instruments will quickly appraise the catch conditions and suggest the most rational decision to the captain.

Bright lights will flare up at night over the surface and in the depth, and a fish pump will start delivering "live silver" into the ship's holds.

An acoustic device that reproduces the sounds of a feeding shoal will gather tuna fishes into a flock. An aromatic bait will attract the fish species into traps.

This looks like a fantastic picture. But each of the above ideas is already being worked on. Some, like the netless catch of Caspian sprats with the aid of light, are already practiced. So fantasy does not play so great a role in the description of future all-purpose fishing vessels.

THE GREEK FISHING FLEET AND MARKET

In mid-1971, Greece's distant-water fleet totaled 49 freezer trawlers with freezing capacity of 16,300 tons. Seven fished shrimp only. Six transport vessels serviced the fleet.

In 1970, the production of this fleet had increased 3% over 1969 due to three basic factors: 1) cancellation of certain price ceilings that enabled fishermen to earn more (this freed 15 vessels withdrawn from service in 1969); 2) increase in fishing time through development of a transhipment system; and 3) extension of hake fishing to South American waters.

Medium-Distance Fleet

The medium-distance fleet totaled 700 vessels: 388 trawlers (15,400 GRT), and 312 purse seiners (4,900 GRT). Forty to 50 vessels operated off Northern Africa; results have been discouraging. Production was down 8% from 1969. The decline has been attributed to poor fishing off Mauritania, the ban on fishing off Libya, and generally declining yields off northwest Africa. Fishing conditions in Greek territorial waters also were unfavorable.

Early 1972 Situation

At the end of 1971, the market for frozen fish weakened and wholesale prices declined. A decision was reached to restrict imports, except those under commercial agreements. Yields on fishing grounds off Northwest Africa were moderate. Because of increased fishing-license cost in Mauritania, and many foreign fleets off that country, Greek vessels are exploring more productive fisheries.

Fishermen Received More in 1970

In 1970, landings by the Greek fishing fleet for all sectors were 122,500 metric tons worth US$78.9 million. This compared with 122,900 tons in 1969. Prices at landing points rose an average 36% above 1969. The Atlantic fleet accounted for 27% (33,268 tons); the Mediteranean and coastal fleet took 43% (52,000 tons) and 21% (33,500 tons). ('Alieia', Dec. 1971; OECD, 1970.)

Greek fishing vessel returning to its home port near Pireus, landing point for vessels supplying Athens. (FAO: H. Henjaud)

JAPAN'S FROZEN-SHRIMP IMPORTS SOAR 2,000% IN 10 YEARS

William B. Folsom

Japan's 1971 shrimp-import season ended with a record spurt in volume and value at year's end. Beginning in October (See Fig. 1), the Japanese increased their imports to 6,808 metric tons worth US$18.9 million; in November, 8,471 tons ($28.2 million) and, in December, 11,429 tons ($41.3 million). Total 1971 imports reached 78,874 tons valued at $214.0 million, an increase of 38% in quantity and 48.7% in value over 1970 imports (57,146 tons worth $137 million). All of Japan's shrimp imports are frozen.

Many American shrimp importers felt at the time that the Japanese "buying spree" was touched off by devaluation of the U.S. dollar and that resulted in large-scale speculation in shrimp by Japanese firms trying to exchange dollars for shrimp. They were correct in that some nonfishery firms (textile,

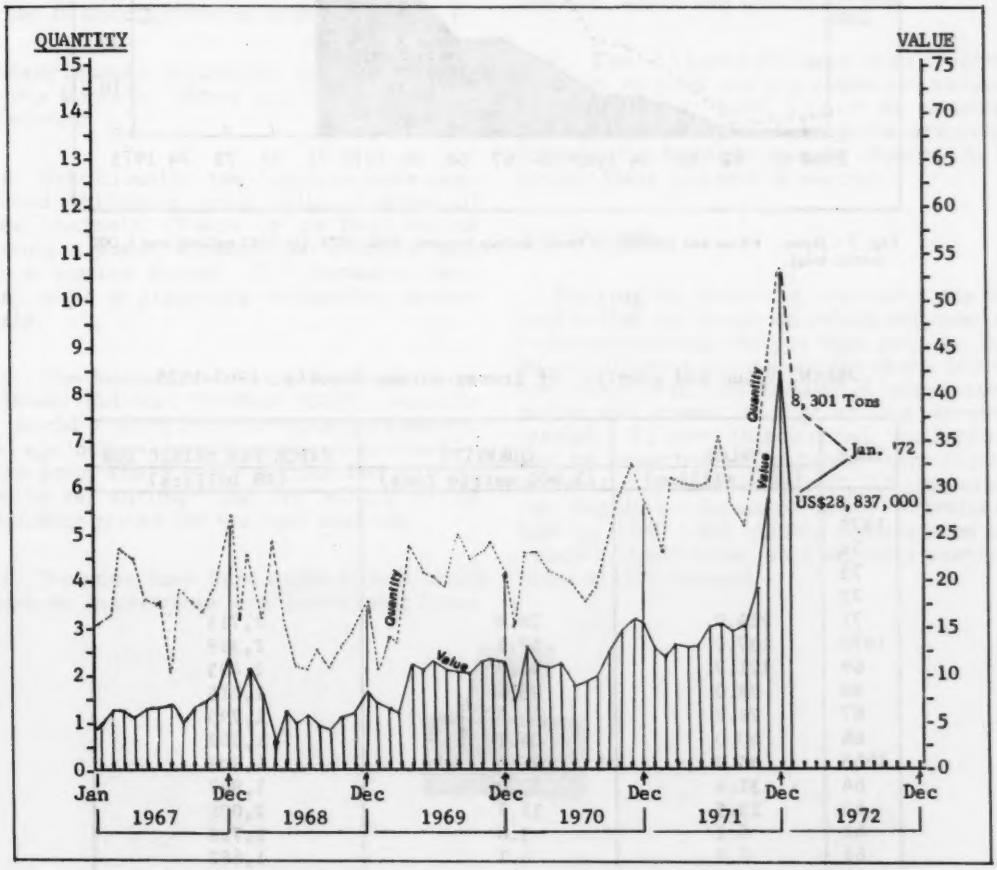

Fig. 1 - Japan. Frozen shrimp imports, value and quantity, by month, 1967-1972 (in 1,000 metric tons and US$1 million).

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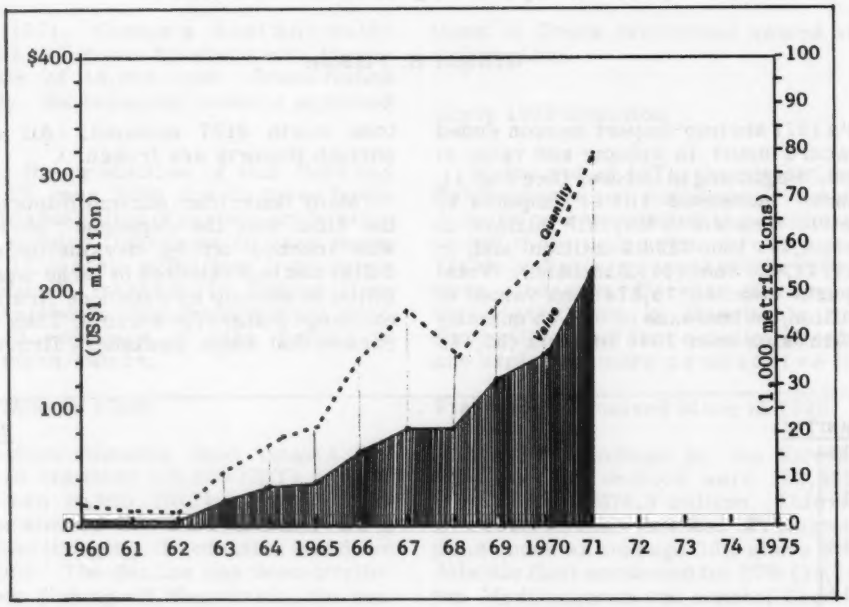

Fig. 2 - Japan. Value and quantity of frozen shrimp imports, 1960-1975 (in US$1 million and 1,000 metric tons).

JAPAN. Value and quantity of frozen shrimp imports, 1960-1975

YEAR	VALUE (US$1 million)	QUANTITY (1,000 metric tons)	PRICE PER METRIC TON (US Dollars)
1975			
74			
73			
72			
71	214.0	78.8	2,715
1970	137.0	57.1	2,399
69	121.7	48.8	2,493
68	78.0	35.2	2,215
67	79.7	44.4	1,795
66	60.0	36.1	1,662
1965	35.9	21.0	1,709
64	31.4	17.0	1,847
63	23.5	11.7	2,008
62	6.2	3.6	1,722
61	6.9	4.1	1,682
1960	6.6	-	

Note: Quantity is expressed in heads-off weight.

cement, and fruit importers) apparently did engage in buying shrimp on the world market. As a result, the Japanese market was reported glutted with certain-size shrimp, and some firms were compelled to sell shrimp below cost.

Trend Began After 1962

Japan's late 1971 shrimp buying was indeed striking, but the increase in imports, accentuated in 1971, is part of a long-term trend that began after 1962 (See Fig. 2). Imports totaled 3,600 metric tons in 1962, rose sharply to 11,700 tons in 1963 and, in 1971, totaled 78,800 tons. This was an increase of over 2,000% in 10 years.

Many reasons account for Japan's growing shrimp imports. Some can be summarized as follows:

1. Traditionally, the Japanese have considered shrimp a great delicacy above all other seafoods. There is no finer way of treating a guest, a client, or a family than with a shrimp dinner. The Japanese have many ways of preparing outstanding shrimp meals.

2. The Japanese worker has more money. In Gross National Product (GNP), Japan is the world's third most prosperous country. Average income of workers has risen steadily to the point where more of them now can afford to eat shrimp--and are willing to pay prevailing prices for the best seafood.

3. Because they have more money, many Japanese housewives are purchasing home freezers, refrigerators, stoves, etc. These purchases have increased sharply in the past 5 years. The housewife now can store frozen shrimp. Along with this development, the frozen-food industry has expanded rapidly. Frozen foods are becoming a big business. The industry has responded vigorously. Supermarkets are being constructed throughout the country.

4. The domestic catch of shrimp (generally sold live or fresh) has been static. It has averaged 60,000 to 70,000 metric tons per year and shows signs of a gradual decline. In the early 1960s, production was as high as 80,000 tons. To meet increased domestic demand, Japan has looked abroad.

5. The Japanese have been investing steadily in joint shrimp ventures overseas. Currently, they have about 25 scattered throughout the world. As more are established, the Japanese can be expected to increase their imports of shrimp.

The Outlook

Barring an economic recession, the outlook is that the Japanese public will continue to demand shrimp and pay high prices. Continued affluence and expansion of the frozen-food industry (including sales of home freezing units) will result in a growing domestic market. To meet this demand, the Japanese can be expected to increase their imports and to compete actively with U.S. importers for supplies. Japanese trade sources say that by 1980 total shrimp consumption may reach 150,000 tons, with imports supplying most of this demand.

JAPAN

CULTURE OF YELLOWFIN AND BLUEFIN TUNA IS SUCCESSFUL

A tuna-culture experiment of the Pelagic Fisheries Research Laboratory, Japan Fishery Agency, has achieved marked success in raising yellowfin and bluefin tuna.

The research centered on (1) collection of spawn from mature yellowfin tuna, fertilization and hatching of eggs, and raising the young; and (2) raising immature bluefin tuna, whose stocks have decreased sharply in recent years.

Yellowfin Experiment

In the yellowfin-tuna experiment, about 1.2 million ripe eggs were collected from two mature yellowfin tuna and fertilized artificially. Hatching required 24 to 30 hours in water temperature of about 79° F (26° C); about 10,000 larvae were produced. One of these larvae lived 20 days--the longest survival in the experiment. Data on food and conditions of the water tank were collected. The experiment likely can be extended to cover the whole process from fertilization to raising of mature yellowfin tuna.

Yellowfin Tuna

Bluefin Experiment

In the bluefin-tuna experiment, young fish were captured by set nets and reared at culturing centers. Some were kept alive through the following winter. When caught in August 1971, the fish weighed 7 to 10 ounces (200 to 300 grams); in January 1972, about 3 kilograms (6.6 lbs).

Bluefin Tuna

Catching Young Fish Difficult

Although the artificial raising of young tuna from eggs collected from cultured, mature fish has succeeded experimentally, the method of catching young fish, such as bluefin tuna, at sea, has defects:

1. Systematic production of fish through culturing is difficult because young fish must be caught and the catch varies greatly from year to year.

2. It is becoming more difficult to adjust the catch for culture in competition with conventional fisheries. Fish culture and commercial fishing interests will have to determine how many young fish can be taken safely without upsetting the resources. This is not easy.

3. Seaweed beds in coastal waters, indispensable for the growth of immature fish, are becoming polluted; as a result, the catch of young fish is decreasing sharply.

So, it has become necessary to rely on artificial propagation--from raising mature fish to spawn collection, fertilization, hatching, and to rearing larvae and young fish.

The success of the latest yellowfin-tuna propagation experiment is an advance in fish culture because yellowfin is considered difficult to raise. ('Asahi Evening News', Feb. 17.)

JAPAN (Contd.):

SKIPJACK VESSELS SWITCHING TO CARP AS NEW BAIT

The Japan Tuna Association (NIKKATSUREN) plans to use grass (or silver) carp, Hypophthalmichtys moritrix, as live bait during the 1972 fishing season. This decision stems from successful experiments in 1971, in which grass carp were transported to the tuna fishery in tropical waters. Grass carp is abundant in Japan. ('Suisan Keizai', Feb. 4.)

NMFS Comment: Live bait is essential to Japan's skipjack (pole-and-line) tuna fishery, which long has had supply problems. The lack of live bait was an important reason for the slow expansion of the skipjack fishery in southwestern Pacific.

The live-bait problem can be summarized as follows:

(1) Anchovy is especially important in the skipjack fishery. However, anchovy is subject to high mortality due to handling. It must be caught, transferred to holding pens, kept for a week, transferred to holding pens aboard tuna vessels, and transported to distant-fishing grounds. Bait mortality normally runs as high as 50-70%. In 1970, anchovy marketed as live bait totaled 24,027 tons, or 10.7% of total anchovy catch. This accounted for only 27% of the skipjack fishery's bait requirements.

(2) The uncertain supply of commercial quantities of live bait in distant foreign ports. This uncertainty inspired bait-research cruises by the government and by industry. Bait-supply depots may be established in certain southwestern Pacific islands in 1972.

The Japan Tuna Association began experiments with grass carp in 1971. The tuna longliner 'Sakura Maru No. 18' fished with about 15,000 grass carp and reported success. In mid-September, the Japanese sent a survey team to Taiwan, where they found the Taiwanese using carp widely in their tuna fishery.

The Japanese now are studying the use of young "nishiki koi," a species of carp, as baitfish. Results have not yet been announced.

The successful experiments with grass carp mean that the pole-and-line fishery should be able to expand into new areas.

* * *

FIRM WILL FISH SKIPJACK FROM PONAPE, U.S. TRUST TERRITORY

The trading firm Marubeni Iida plans to form a skipjack venture with the Ponape District Fishery Corporation, U.S. Trust Territory of the Pacific Islands. On Feb. 10, 1972, Iida sent a 5-man team to that island on a one-month baitfish survey trip.

Fishing plan for the first year involves four 20-40 gross-ton skipjack poling vessels and one refrigerated mothership (500 to 1,000 gross tons) to be chartered from Hoko Suisan. The catch will be brought back to Japan. Plans under consideration include construction of a cold storage and processing plant at Ponape.

Other Venture Suspended

In 1971, trading firm Mitsui Bussan and the Okinawan Sanyo Fishing Co. established a joint skipjack fishing venture at Ponape. However, they have suspended fishing temporarily because of poor fishing conditions. ('Katsuo-maguro Tsushin', Feb. 23.)

* * *

GYOGYO TO FISH SKIPJACK IN INDIAN OCEAN

Kaigai Gyogyo (Overseas Fisheries Co.), one of several fishing skipjack off New Guinea and Indonesia, has decided to extend operations to the Indian Ocean. This decision followed a feasibility study at Seychelles Island in the Indian Ocean. Details are not available, but reports indicate one or two Gyogyo skipjack vessels have been fishing experimentally off Madagascar since Feb. 9, 1972. Gyogyo's advance into the Indian Ocean indicates increasing industry interest. ('Katsuo-maguro Tsushin', Feb. 22.)

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JAPAN (Contd.):

COMPETITION FOR SHRIMP SHARPENS IN AFRICA

Intense competition looms among major Japanese trading firms for African shrimp, 'Mainichi' reported on March 3. Marubeni, C. Itoh, Sumitomo Shoji, Nissho-Iwai, and Mitsui are all interested.

Marubeni and Kyokuyo Hogei (large fishing company) set up a joint shrimp venture in Madagascar. Itoh plans joint ventures in Nigeria and Madagascar. Sumitomo Shoji plans to send fishing experts to Africa to survey resources. Nissho-Iwai and Mitsui are interested in a survey.

A First Step

The trading firms hope to "use their fishing ventures as footholds for their full-scale entry into the African markets and for the development of rich African mineral resources."

NMFS COMMENT: The Japanese are anxious to establish themselves in Africa. Shrimp resources there remain relatively untapped and the Japanese want to be first.

* * *

3 VESSELS EXPLORE OFF PERU

Three Japanese vessels began exploratory fishing in November 1971 off Peru for marine resources not now consumed there. Peru has an annual catch of over 10 million metric tons, nearly all anchovy. The anchovy are reduced to fishmeal for export.

Japanese participation in this research resulted from an agreement involving Nihon Hogei (a whaling firm), Mitsubishi Corp. (a trading firm), and EPSEP, Peru's food-fish promotion agency. Three 350-GRT vessels are exploring.

The 'Challwa Japid' is concerned mainly with pelagic and demersal fish species. The 'Koyo Maru' and one other vessel are searching for shrimp. The vessels operate with mixed Japanese-Peruvian crews.

For Peruvian Consumers

The fish caught by the Challwa Japid are destined solely for the Peruvian market. The Peruvians hope to develop a larger market for fish to meet local protein needs. The total catch will meet Peruvian demands first; the remainder will be exported to Japan. ('Pesca', Jan. 1972.)

* * *

OCEAN DUMPING RECOMMENDATIONS SUBMITTED

The Japanese fishing industry is reported generally pleased with recommendations on disposal of wastes in the sea submitted on March 16 by the Central Pollution Advisory Council to the Director General of the Environment Agency. These specify:

(1) the disposal of non-hazardous wastes (coli, mud) should be 50 miles or more from shore; (2) disposal of non-hazardous wastes (cinder, scrap-metal) should be confined to 5 places where water is deeper than 1,500 meters (3 in Pacific, 2 in Japan Sea); and (3) disposal of hazardous wastes (mercury, cadmium, lead) should be in the same 5 areas after being placed in concrete or sealed in suitable containers.

Pollock fishermen operating their own boats are being urged by processors, shallow-sea culturists, and administrators to process their catch aboard ship before returning to port in order to minimize pollution along Japan's coast. ('Suisan Keizai', Mar. 21-22.

* * *

FROZEN-TUNA EXPORTS ROSE IN 1971

In 1971, Japan exported 73,460 metric tons of fresh, chilled, or frozen tuna valued at US$38 million. This is an increase over 1970's 62,414 tons worth $32 million. It reverses the slump that began in 1967 (see Figures 1 and 2).

Fig 1. JAPAN.. Exports of frozen skipjack, albacore, yellowfin and bluefin tunas, by quantity; 1960-1971.

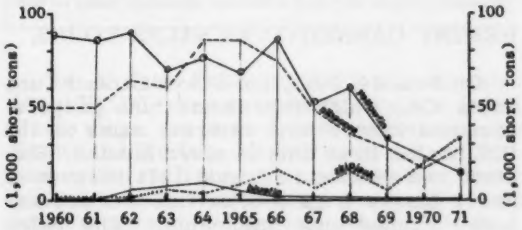
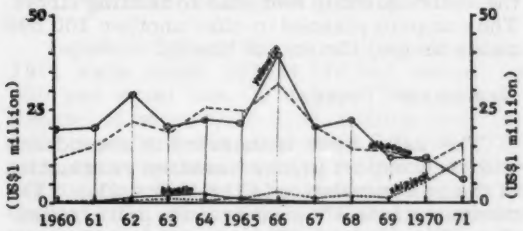


Fig 2. JAPAN. Exports of frozen skipjack, albacore, yellowfin and bluefin tunas, by value; 1960-1971.



Skipjack tuna became the leading export item: 32,342 tons in 1971, 20,564 tons in 1970. The Japanese have increased their fishing effort for it in the southern Pacific.

Albacore exports also increased in 1971: 25,116 tons; 17,280 tons in 1970. This reversed a long, steady decline that began in 1964-65.

Yellowfin exports decreased in 1971: 13,961 tons; 21,756 tons in 1970. It continued the decline begun in 1967-68.

Bluefin exports (0.2 ton versus 22 tons in 1970) remained small. This was due primarily to high domestic demand for it as "sashimi" (thinly sliced fish served raw). Japanese importers flew bluefin to Japan from the U.S., Taiwan, and Australia to meet demand.

Where Exports Went

The U.S., Japan's best customer, imported 77,563 short tons of frozen tuna and tuna loins worth US$41 million. (Includes direct exports and transshipments.) This was a 36% increase in quantity and 42% in value over 1970. It resulted partly from the 10% U.S. surcharge on canned tuna goods imposed in fall 1971. Frozen tuna was not subject to the surcharge. So it helped fill the gap left by slumping canned tuna sales due to surcharge and decontamination problem.

Also, the Japanese exported sizable quantities of tuna to Puerto Rico, American Samoa, and Fiji for processing and/or transshipment to the U.S.

Italy was another important market. It is normally supplied by Japanese tuna fleets in the Atlantic, mainly off West Africa. Ghana was one of Japan's principal African buyers. Most of the remainder went to Western Europe.

JAPAN (Contd.):

TWO FIRMS CEASE SAURY FISHING OFF U.S. WEST COAST

Taiyo Gyogyo and Nippon Suisan have announced they will not fish for saury off the U.S. Pacific coast in 1972 due to financial losses during the past three years. The other firms, Nichiro, Hoko Suisan, and Hokuyo Suisan, still plan to continue their exploratory fishery. ('Suisan Keizai', Feb. 10.)

NMFS Comment: The Japanese began exploring for saury off the U.S. West Coast in 1969 when their fishery off Japan reached a low--52,290 tons taken by 1,200 vessels. In 1970, the Japanese coastal saury catch increased to to 87,000 tons; by Nov. 1971, to 176,000 tons. This increase means that Japan needs to rely less on distant-water production. Exploratory fishing for saury off the U.S. has been unprofitable: in 1969, 500 tons; in 1970, 3,278 tons taken by 15 vessels; and 1,300 tons by 10 vessels in 1971.

* * *

SAURY FISHING OFF U.S. TO BE REDUCED SHARPLY

Japanese distant-water saury fishing will be cut sharply this year. For the past 3 years, the Japanese have been fishing experimentally in the central Pacific and off the U.S. northwest coast. They sustained heavy losses because of poor fishing. Only a very few saury vessels are likely to operate this year in that region. Most firms that had sent vessels have cancelled fishing plans for 1972 because price improvement in Japan seemed uncertain; in contrast, the coastal fishery seems headed for a good season.

Begun In 1969

Saury fishing off the U.S. West Coast was first undertaken in 1969 by 7 government-licensed vessels. On that trip, they caught many off Vancouver, B.C., in September, but their total catch was only about 470 tons. In 1970, 36 vessels were licensed, but only about 20 fished; these processed about 3,000 tons of frozen fish. In 1971, the number of licensed vessels was increased to 48; of these, 12 or 13 participated and processed about 1,000 tons of fish.

Problems Facing Japanese

The problems facing the Japanese are: 1) long distance to the fishing grounds; 2) unstable fishing conditions; 3) absence of large fish (even a good-sized saury measured only 9-10 inches and weighed about 2.9 ounces; and the count of 120-130 fish per 22-pound box obtained from the catch is not a very good size, even for tuna bait); and 4) heavy occurrence of parasites--making the fish unsuitable for humans. ('Suisan Tsushin', Mar. 28.)

* * *

RESUME CANNED-TUNA SALES TO U.S.

On Feb. 24, 1972, the Tokyo Canned Tuna Sales Co., which represents tuna packers, resumed canned-tuna-in-brine sales to the U.S. for the first time in seven months. Exports were halted in August 1971 because of heavy losses from U.S. detention of decomposed canned-tuna shipments. The Sales Company offered about 300,000 cases--about 250,000 cases of canned white-meat tuna and 50,000 cases of light-meat tuna. By March 3, the entire quantity was sold to trading firms. The company planned to offer another 300,000 cases around the end of March.

New Export Prices

The sales were transacted in accordance with new export prices based on revaluation of the yen in relation to the U.S. dollar. The new quotations show an average price reduction (in yen) of 5.6% for canned white-meat tuna and 2.9% for light-meat tuna. The range was unexpectedly small, particularly for the institutional pack, compared with the 16.88% upward revaluation of the yen (new official exchange rate is 308 yen = US one dollar). ('Suisan Tsushin', Feb. 26; 'Kanzume Joho', Mar. 6.)

Refunds for Recalled Canned Tuna

The Sales Company has informed trading firms that their canned tuna rejected by the U.S. will be repurchased in quantities up to 4,000 cases per firm at 5,600 yen (US$15.55) a case. Payment will be made upon presentation of a warehouse receipt, provided labels have been removed from all cans before they are returned.

JAPAN (Contd.):

	Price Per Case (Exwharehouse, Shimizo)							
	White Meat Tuna				Light Meat Tuna			
	New Price		Old Price		New Price		Old Price	
	Yen	US$	Yen	US$	Yen	US$*	Yen	US$
Solid								
7-oz. 48s	5,180	17.27	5,600	15.55	3,950	13.17	4,150	15.53
13-oz. 24s	5,080	16.93	5,550	15.42	3,870	12.90	4,110	11.42
66½-oz. 6s	6,250	20.83	6,450	17.92	4,850	16.17	4,900	13.61
Chunk								
66½-oz. 6s	-	-	-	-	4,630	15.43	4,680	13.00

*Dollar price represents conversion from yen at going exchange rate of 300 to one U.S. dollar. Previous rate: 360 yen to one.

As of late February 1972, an estimated 160-170,000 cases were shipped back to Japan. When these are tested and approved by the Health and Welfare Ministry, the Sales Company will resell them to mass-feeding institutions, such as the defense forces and school lunch program. ('Kanzume Joho', Feb. 21.)

* * *

1971 FISHERY IMPORTS ROSE SHARPLY

Japanese fishery imports during Jan.-Dec. 1971 were about US$424,178,000, based on 360 yen equal one US dollar. This was increase of more than $105 million over the 1971 imports worth about $318,900,000. The yen was revalued upward following implementation of new U.S. economic policy in August 1971. So imports of fishery products rose sharply during second-half 1971. By December, the new official exchange rate was 308 yen to the dollar.

Frozen Shrimp 50% of Imports

Frozen shrimp imports rose spectacularly from 1970's 57,146 tons worth $137 million to 78,874 metric tons valued at $203 million. These imports represented close to 50% of total fishery imports.

Among other fresh and frozen products scoring substantial gains were skipjack tuna, 17,587 tons (5,399 tons in 1970), and octopus, 64,455 tons (35,000 tons). ('Suisan Shuho', Mar. 5.)

* * *

MINKE WHALE FLEET ATTAINS GOAL OF 3,000 WHALES

On Feb. 18, 1972, Taiyo-operated Antarctic minke whale fleet reached its goal of 3,000 whales. The fleet is formed by the factoryship 'Jinyo Maru' (9,113 gross tons) and 4 killer boats. The fleet operated near 64° S. and 121° E. The average kill per day was 37 whales, higher than the planned 30/day. Body length of whales averaged 8.5 meters (previously believed 7-8 meters). The catch was processed into 7,500 tons of frozen meat and 1,000 tons of whale oil. This was the first time in Japanese whaling history that a mothership-type minke whaling expedition was sent to the Antarctic. ('Suisan Tsushin', Feb. 24.)

* * *

CRAB FLEETS DEPART FOR BRISTOL BAY

Two crab fleets departed Hokkaido, Japan, for Bristol Bay on March 1, 1972. The factoryship 'Keiko Maru' (7,536 gross tons) with 16 catcher boats and two 'Kawasaki' deck-loaded boats will fish from March 13 to September 24 and return to Japan October 5. Its 1972 quota is 19,148 cases of king crabs and 7,460,000 tanner crabs.

The factoryship 'Kyo Maru' (7,480 gross tons) with 14 catcher boats and two 'Kawasaki' boats will fish from March 11 to September 25 and return to Japan October 30. Its quota is 18,325 cases of king crabs and 7,140,000 tanner crabs.

JAPAN (Contd.):

Both factoryships will freeze their king crab catch instead of canning them aboard. The king-crab quota for the frozen production is 440,000 crabs for 'Keiko Maru' and 425,000 crabs for Koyo Maru. ('Suisan Tsushin', Mar. 31.)

* * *

ROUNDNOSE FLOUNDER
HATCHED EXPERIMENTALLY

The roundnose flounder--Eopsetta species, called "mushi-garei" in Japan, where it is very expensive flatfish--has been hatched at the Shimane Prefectural Fishery Research Station.

The experiments were conducted by Yojiro Imazeki, chief of Utilization and Research Station. They began in a tank on Jan. 31, 1971. Imazeki injected sex-stimulating hormones into the fish on Feb. 10 and 16. One female hatched 40,000 to 50,000 eggs on Feb. 20. The water temperature was kept at about 14°C (50°F) and salinity increased. Roundnose flounders live at depth of 130 meters (426 ft.).

Exvessel prices for "mushi-garei" range from US$0.73 to $1.10/lb., and retail at about $0.48 apiece. ('Mainichi,' Feb. 28.)

* * *

SPECIAL SHIPBOARD SCALE
DEVELOPED

Scales to measure weights aboard ship can err around 10%, even more in heavy seas. This is troublesome because proper scales are needed on factoryships for canning operations. Now a special scale has been developed to weigh objects correctly even in pounding seas.

Very Accurate

The scale was developed by Takubo Kogyo Co. of Osaka with Professors Ryuichi Masuo and Chikayoshi Maeda of the Osaka Institute of Technology.

Its error is less than 1/400th. The scale is designed so it will not be affected by a rolling ship. Tests were conducted for 6 months aboard a Japanese trawler in the Bering Sea.

Commercial sales of the scales have begun. ('Japan Economic Journal', March 1.)

* * *

THERMAL EFFLUENT USED
FOR FISH CULTURE

A fish-culture pond believed to be the world's largest is being built at the Tokai atomic power station northeast of Tokyo. The budget is $550,000 over 5-year period. The project is to breed fish through the use of heated water discharged by the nuclear power plant.

Under present plans, 20,000-square-foot pond will be built first. A larger breeding pond of 70,000 square feet was scheduled to be completed by March 1972. Breeding will begin 3 months later. Sea bream, prawn, abalone, and eels are being considered for breeding and cultivation. Sponsors of the project are the Japan Fishery Resources Conservation Association, Science and Technology Agency, and the Fisheries Agency. The electric power industry will grant $490,000 in subsidies. ('Japan Report', Jan. 1.)

* * *

FISHERY AID MISSION TO VISIT
'THIRD WORLD'

The Japanese will send a "Fishing Ground and Marine Resources Development Cooperation Mission" to Latin America, Africa, and Southeast Asia later this year. The mission is being planned by officials of the Japanese Foreign Ministry, Fishery Agency, and the Japan Fisheries Association. The goal will be to explore ways Japan can help in development of marine resources.

The Agenda

The mission will consist of three 5-man groups. The first two teams will leave in September 1972 for Latin America (Argentina and Brazil) and Africa (Senegal and Rwanda). The African team also will visit Spain and Portugal. The last group will depart in November and visit Thailand, Burma, Malaysia, and Singapore. The teams will spend two weeks in each country. ('Japan Economic Journal', Feb. 11.)

* * *

NEW NICHIRO HEAD STRESSES 'SYSTEMATIZATION'

"The secret for success in business operation lies, in the final analysis, in how top executives get hold of correct information and data and pass them along the company grapevines in the shortest possible period of time." That is what Takeshi Hirano, new president of Nichiro Fisheries Co., told the Japan Economic Journal, Feb. 22, 1972.

"For this purpose," Hirano added, "rank-and-file employees, who form the base of a 'company triangle' should be in front, while top executives, who occupy the pinnacle of the 'triangle,' should hold up the rear. If top executives elbow their way to the front and personally urge their employees to greater efforts, the tactic is liable to backfire. Under such circumstances, employees are most likely to pay greater attention to currying favor with top executives than to their own business roles."

Troubled Fishing Industry

The fishing industry is plagued by knotty problems, including tightening international controls on fishing and the serious business slump caused by the "dollar shock."

"I will try my damnedest," Hirano states, "to turn our company into an all-embracing foodstuff manufacturer from a mere fishery firm.

"Fishery is very much a seasonal industry, so to speak. If we continue to depend on fishery alone, we shall not be able to cope with the rapid fluctuations of the world's economy. We have to process fish and other marine products and turn them into commodities equipped with high added value."

Nichiro Is Diversified

Already, Nichiro Fisheries is more than a fishery company with its subsidiaries engaged in a wide variety of business, including bakery and production of cola, feedstuffs, frozen foods, etc. It has about 6,000 employees.

Chukyo Coca-Cola Bottling Co., one of the subsidiaries, has become Nichiro's biggest profit earner. "We will go into any fields related either with fishery or foodstuffs in general," Hirano says.

He emphasizes frozen foods: "The living standards of the Japanese people have been greatly elevated in recent years. The tendency to use fish 'clean'--without guts, bones and heads etc.--will grow in the future. This year will prove a year of preparations for the serious debut of frozen foods."

The problem, he noted, is that the systematization of the nation's distribution channels is still far from completed.

"If there is no rail," Hirano says, "there will be no transportation. We will put everything into building and consolidating frozen-food distribution chains this year."

Role in World Arena

Hirano will advance into the international arena. Nichiro is now engaged in

consignment production for Nichiro Heinz Co. This is a joint foodstuff sales venture with J. H. Heinz Co. of the U.S.

Nichiro is emphasizing too the development and import of marine resources in foreign countries, especially African and Latin America.

"Self-restraints are indispensable in fishing operations," Hirano explains. "If we sail mighty 'black ships' in the seas off developing nations whose only assets are deserts and the seas and start catching fish and prawns at random, such nations are certain to believe that we are marauding on their own natural resources. Fishing is one industry in which international cooperation and restraints are of maximum importance."

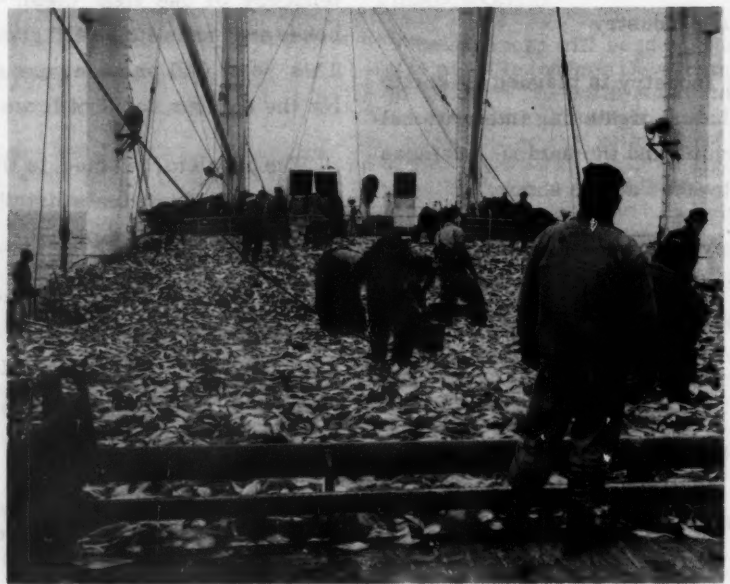
[Note: Hirano and 4 top aides plan to discuss fisheries, processing, and feed with Chinese officials after the 1972 Spring Canton Trade Fair.--'Suisan Tsushin,' March 2.]

His Management Philosophy

In Hirano's management philosophy, front-line workers get top priority. "Success of business operations heavily depends on front-line workers. Our company will enjoy success only when the three different armies of our employees--men working on fishing boats, men engaged in factory works and men selling our products--are working truly hand in hand."

To attain this, he advocates systematization of distribution channels and management structures.

"If men get used to working as part of systems, the spirit of cooperation--or esprit de corp, if you like to call it--is naturally born and men will stop having 'scoop mentality.'"



TAIWAN'S FISHERY PRODUCTION ROSE 6% IN 1971

Taiwan's total fishery production in 1971 reached 650,096 metric tons, up 6% over 1970's 613,044 metric tons, but below the set target of 665,000 metric tons.

	1972	1971	Increase
	M.T.	M.T.	%
Deep-sea fisheries	293,780	277,955	5.7
Inshore fisheries	250,679	234,704	6.8
Coastal fisheries	27,876	27,690	0.7
Fish culture	77,761	72,695	7.0

The 7% increase in fish-culture production was due mainly to the conversion of rice fields into fish ponds. It is estimated that about 3,000 hectares of low-yielding rice fields were converted for rice production in 1971.

Mullet Propagation

Continuing the work started 8 years ago, the Tungkang Marine Laboratory in South Taiwan produced about 60,000 fingerlings of grey mullet by induced spawning. This was made possible by the completion of the weather-proof nursery ponds at the laboratory.

Shortage of Seed Eels

The acreage of eel ponds in Taiwan increased to about 1,000 hectares by the end of 1971. It was estimated that about 30 tons of seed eels would be required to stock these ponds. The catch of elvers from the coastal waters, however, was only about 15 tons as of the end of February. Due to the shortage, the price has soared from about NT$1 (US$0.025) at the beginning of November to NT$7 (US$0.175) for each elver in February. In face of this situation, the government has prohibited export of elvers and permitted their import from Japan.

--T. P. Chen
Chief, Fisheries Division

S. KOREA WILL INCREASE DEEP-SEA FLEET TO 800 BY 1976

South Korea will enlarge its deep-sea fishing fleet from the present 335 to 800 vessels by 1976, according to Director Dong-soo Kim, Office of Fisheries. The expansion will require US$200 million in foreign exchange. Kim plans to conclude a fishery cooperation accord with Spain and Ivory Coast this year to facilitate Korean fishing in the Atlantic.

To Increase Fisherman Income

S. Korea also plans to boost per-capita fisherman income from the present 53,000 won (approx. US$140) to 80,000 wons ($210) a year by 1976. There are 1,160,000 fishermen in Korea. Their annual income is $10 less than farmers'. ('The Korean Herald', Feb. 8.)

SOUTH PACIFIC

AUSTRALIAN ROCK-LOBSTER SEASON LOOKS PROMISING

The 1971-72 rock-lobster fishing season in Western Australia and southern States looks fairly good, reports 'Australian Fisheries', Feb. 1972. The State catch will be about 17.9 million pounds, about the previous season level--but up from the 15.5 million pounds in 1969-70.

Catches in the central area of Victoria have been poor. In western and eastern areas, catches have been good.

On the West and East Coast of Tasmania, catches are reported better than average. Catches in the South Australian season have been poor.

Prices paid to fishermen run from A$1 to A$1.20 per pound. (A$1 equals US$1.15.)

The 1970-71 record production was up 13% from 25.2 to 28.5 million lbs. Western Australia, main producing State, took 17.8 million pounds.

OUR CHANGING FISHERIES - Sidney Shapiro, Editor, available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, $9 a copy.

This book was produced by specialists of the National Marine Fisheries Service. Its editor, Dr. Sidney Shapiro, has retired from NMFS after many years of noteworthy service in the U.S. and abroad.

Its story line ties the background of U.S. fisheries to today's complex, often-troubled industry--and points the direction these fisheries are likely to take in the future. Those who believe that the world's No. 1 problem is the population explosion will find special interest in the discussion of the ocean's food potential.

Dr. Shapiro writes:

"The fisheries are complex. Our experts are concerned with a multitude of technical subjects, as diverse, for example, as the classification of species, life history studies, exploratory fishing, gear and vessel development, chemical and physical analysis of the environment, and management of the resources. Other experts are concerned with utilization, that is, the combined effort in processing and marketing that puts the aquatic resources before you as savory seafood. Fish is even an important element in growing the chicken and eggs that you eat."

A "fishery" is many things: it is fishing; it is the place to catch fish or other marine resources; it is fishermen and the establishment they constitute; it is the technology involved; it is the legal right to catch fish at a certain place or in certain waters.

Sharing their knowledge of our commercial fishery resources in this book are biologists, chemists, bacteriologists, economists, administrators, trade specialists, and others.

The book is as attractive as it is informative. It contains many colorful maps, drawings, and graphics prepared by Bob Hines, artist-illustrator for the Bureau of Sport Fisheries and Wildlife, and George Lampathakis, Art Director for Creative Arts Studio.

The breadth and depth of the enterprise captained by Dr. Shapiro reflect the experience of a century-old organization.

COASTAL ZONES

"Coastal Zone Management: Multiple Use With Conservation," edited by J. F. Peel Brahtz, 352 pages, $19.50. John Wiley & Sons, Inc., Publishers, 605 Third Avenue, New York, N.Y. 10016.

There are demands on the coastal zone by diverse groups. To develop good policies and viable objectives, regional planners must combine the opinions and advice of scientists, engineers, economists, public officials, and the public. The book is aimed at persons who contribute to, or benefit from, the management function.

Part I examines the "multiple use of Coastal Zone resources in terms of the structure and conflict of goals." Part II discusses technological requirements and resources. It suggests how technology can be applied to the problem of goal conflict.

The book is a useful reference for: public planners, who must "formulate concepts of land use" that comply with public policy while getting the most use out of it; land developers; conservation groups; students and specialists.

CONTENTS

Part 1: GOALS AND MULTIPLE-USE

- National Goals, State's Interests, and Jurisdictional Factors
- Conservation of Biological Resources of the Coastal Zone
- Social Needs and the Urban-Marine Environment
- Traffic and Transport Needs at the Land-Sea Interface
- Conservation of Mineral Resources of the Coastal Zone

Part 2: SYSTEMS PLANNING AND ENGINEERING

- Systems Planning and Control: Coastal Regions
- Information Systems and Data Requirements: Coastal Development Planning
- Ocean Installations: State of Technology
- Marine Waste Disposal Systems: Alternatives and Consequences
- Marine Transport Systems: State of Technology

LAMPREYS

"The Biology of Lampreys," edited by M. W. Hardisty and I. C. Potter, Vol. 1, 423 pages, $22.50. Available from Academic Press Inc. (London) Ltd., 24-28 Oval Road, London NW1, and Academic Press Inc., 111 Fifth Avenue, New York, N.Y. 10003.

Lampreys are very important to biologists for two reasons: in their study of developmental biology and evolution--and as laboratory animals for physiological and biochemical research. In recent years, biologists have made significant progress in studies of lampreys during their larval life as microphagous feeders and as parasites in their adult stage.

The editors say no attempt had been made to "collate and review" recent developments. The 2-volume work tries to do this.

Students of vertebrate zoology will find detailed background information on the "systematics, life histories, ecology and behaviour of lampreys."

The destructive role of lampreys in the U.S. Great Lakes is discussed.

CONTENTS OF VOL. 1

Distribution, Phylogeny and Taxonomy
Lampreys in the Fossil Record
The Behaviour, Ecology and Growth of Larval Lampreys
The General Biology of Adult Lampreys
Sea Lampreys in the Great Lakes of North America
Paired Species
The Chromosomes
Gonadogenesis, Sex Differentiation and Gametogenesis
Embryology

SALT-WATER FISHING

"Salt-Water Fishing From Boats," by Milt Rosko, paperback, $2.45, Collier Books, 866 Third Avenue, New York 10022.

The book aims to give the fisherman the information he needs to fish successfully in the Atlantic, Pacific, and in the Gulf of Mexico. It describes each coastline separately. The author tells how to get the most out of a fishing trip. He explains chumming, trolling,

rigging, baiting, casting, fighting and landing the catch.

The book describes tackle for many fishing situations. Boats suitable for fishing--from party packet to private skiff--are discussed.

Included is a detailed list of the fish the boatman is likely to encounter--from African pompano and winter flounder to California yellowtail.

There are more than 100 illustrations.

UNITED KINGDOM

"FISHING NEWS Directory and Equipment Guide 1972," editor John E. Webb. Published by Arthur J. Heighway Publications Ltd., Ludgate House, 110 Fleet Street, London EC4A 2JL, $7.20.

The contents of this latest reference are:

Official List of UK Fishing Vessels 25 Tons and Over
Owners, Managers and Vessels of Individual Fleets
Number of Vessels in Fishing Ports of the United Kingdom
Builders and Their Facilities
Vessels Recently Completed, Under Construction or on Order
Suppliers and Manufacturers
Wholesale Merchants at Main Ports
Authorities, Association and Organizations
General Information
Alphabetical Index
Advertisers' Index

SALMON AND TROUT

"SALMON and TROUT--A Resource, Its Ecology, Conservation and Management," by Derek Mills, 351 pp., March 1971, $14.95. St. Martin's Press, 175 Fifth Ave., N.Y. 10010.

The Atlantic salmon (Salmo salar), the trout (S. trutta), and other salmon family members are distributed widely in temperate regions. The conditions affecting their future as an important fishery resource are extremely varied. "To produce sound plans for their future conservation and management," writes Mr. Mills, "it is necessary to review their history, value and method of exploitation and consider the ecology of the individuals forming the resource."

The author has fashioned the book to aid students in ecology, fishery management and regional planning. He also had in mind "fishing proprietors, river authorities, district fishery boards, estate managers, and engineers, and angling associations."

The book is a useful summary of information about the study, conservation, and management of game fish. Their future depends heavily on enlightened management efforts.

Part I focuses on man's exploitation of the resource. It deals with history, catching methods, and value of the salmon and trout fisheries. To understand the impact of exploitation on a renewable or biological resource, its ecology must be known.

So Part II provides a comprehensive account of the ecology of salmon, trout, and other salmon family members. Exploitation is not the sole factor affecting them and their environment. Part III describes these factors. Much space is devoted to pollution and hydroelectric development. Part IV details conservation and management of the resource.

Finally, the future of the salmon and trout fisheries is discussed. The main subjects are the development of the high-seas salmon fishery and the methods of regulating stocks in home waters. The future of trout fisheries for commerce and recreation and fish cultivation is considered.

Mr. Mills warns about the effects of insecticide residues.

TRY A TUNA TEMPTER TODAY

Wake up taste buds with Tuna Tempters--a new creation from the National Marine Fisheries Service. This recipe was designed to arouse and satisfy appetites while assuring Mom that her hungry eaters are getting hot, wholesome nourishment. Little kids, big kids, and kids of all ages love tuna, and it's easy to see why. This satisfying seafood is power-packed with a generous supply of protein as well as other valuable nutrients--and it tastes so good! Tuna's versatility is well known, too; homemakers everywhere rely on this tasty fish for snacks, dips, cocktails, salads, casseroles, loaves, patties, chowders, burgers, and sandwiches. Tuna is also delightful eating just as it comes from the can.

Tuna was rather a latecomer to the canning industry, having started in the early part of the 20th century. The growth of the California-based tuna industry, however, has been phenomenal and now equals or exceeds most other canned fishery products in volume and sales. The reason, of course, lies in the quality and excellence of the fish as well as in the modern techniques and up-to-date, sanitary equipment and plants where the canning is accomplished. The tuna industry had the homemaker in mind when it planned the size of the cans. Tuna is canned in four sizes for consumer use: $3\frac{1}{4}$ to $3\frac{1}{2}$ ounces for individual servings; $6\frac{1}{2}$ to 7 ounces for salads for two or combination dishes; $9\frac{1}{4}$ ounces for medium-sized families; and $12\frac{1}{2}$ to 13 ounces for larger families. Tuna is easily digested, low in calories, and economical because there is no waste in the compactly packed and compressed cans.

Tuna Tempters blends the goodness of tuna with a medley of other foods such as onion and celery for crunch and texture interest, cheese and hard-cooked eggs for smoothness and added nourishment, and sweet pickle relish and stuffed olives for flavor interest. The succulent mixture is placed between bun halves and securely wrapped in foil. This unusual recipe is adaptable, too; the Tuna Tempters may be heated in the oven for immediate enjoyment or they may be stored in the freezer and used at the convenience of the homemaker. What a tempting way to satisfy kids of all ages! Be sure to try Tuna Tempters soon!

TUNA TEMPTERS

1 can ($6\frac{1}{2}$ or 7 ounces) tuna drained and flaked	2 tablespoons finely chopped onion
$\frac{1}{2}$ cup shredded cheddar or American cheese	2 tablespoons drained sweet pickle relish
$\frac{1}{2}$ cup thinly sliced celery	2 hard-cooked eggs, chopped
$\frac{1}{3}$ cup sliced stuffed olives	$\frac{1}{4}$ teaspoon salt
$\frac{1}{4}$ cup salad dressing	6 hamburger buns, split and buttered

Combine ingredients, except buns; mix well. Spread an equal amount of tuna mixture over bottom halves of buns; cover with bun tops. Wrap each Tuna Tempter securely in aluminum foil. Place on baking sheet. Heat in a moderate oven, 350° F., about 25 minutes or until sandwich filling is hot. If desired, these may be made ahead of time and stored in the freezer. Heat frozen Tuna Tempters in moderate oven, 350° F., about 40 minutes or until filling is hot. Makes 6 servings.

(Source: NMFS, NOAA, U. S. Department of Commerce, 100 East Ohio St., Room 526, Chicago, Ill. 60611.)

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BACK COVER: Tile fish aboard NMFS Research Vessel 'Albatross IV'.

(Robert K. Brigham)

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